# NI 43-101 Technical Report on Updated Resources Montagne d'Or Gold Deposit, Paul Isnard Project, Commune of Saint-Laurent-du-Maroni, NW French Guiana

**Effective Date: April 11, 2015**
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**Report Prepared for**


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# 1 Summary

This report was prepared as a National Instrument 43-101 Technical Report (Technical Report) on Updated Resources for Nord Gold N.V. (Nordgold) with Columbus Gold Corp. (Columbus) by SRK Consulting (U.S.), Inc. (SRK) on the Montagne d'Or Gold Deposit (Montagne d'Or) located in French Guiana. Columbus is the Project owner/operator and is currently exploring the deposit under an option agreement with Nordgold.

## 1.1 Property Description, Location and Ownership

Montagne d'Or is part of the larger Paul Isnard Project (Project). The Project consists of eight mining concessions and two pending exploration permit applications covering a total area of 190 $km^2$. The Project area and mining concessions are located in the northwestern portion of French Guiana, South America. The project area extends from longitude 53° 53' 52'' W (UTM 178,475) to 54° 03' 09'' W (UTM 161,360), and latitude 4° 40' 59'' N (UTM 518,322) to 4° 51' 03'' N (UTM 536.922). The Project also includes historic artisanal mining operations, exploration roads, drill pads, a core logging/storage facility and a base camp. The Camp Citron base camp is located approximately 4 km northwest of the deposit. Columbus is the Project owner/operator and is currently exploring the deposit under an option agreement with Nordgold.

## 1.2 Geology and Mineralization

The Montagne d'Or deposit is an Archean age, VMS gold deposit that has undergone remobilization and shear zone style deformation. The deposit is located within the northern greenstone belt of the Guiana Shield in French Guiana. Mineralization is hosted within the two billion year old, Paramaca Formation composed predominantly of meta-volcanic and meta-sedimentary units. These units have been deformed by ductile deformation resulting in tight to isoclinal folding and shearing as well as a pervasive foliation striking east-west and dipping steeply to the south. The current model of gold mineralization is a high sulfidization, volcanogenic type. Significant portions are thought to have been emplaced as replacement style mineralization. Subsequently, the mineralization has been deformed and partly remobilized within structural controls. Gold mineralization is associated with primary sulfide minerals as replacements within pyrite and chalcopyrite. At a macroscopic scale, the following five types of mineralization have been identified in mapping and drill core logging:

- Semi-massive sulfides (SMS, >20% sulfides) with associated gold mineralization;
- Sulfides as disseminations and stringers with associated gold mineralization;
- Late-stage disseminated euhedral pyrite mineralization;
- Rhythmic mafic tuff with associated pyrrhotite mineralization; and
- Gold mineralization associated with quartz veins.

## 1.3 Status of Exploration, Development and Operations

The database supporting the resource estimation of this report is current to April 11, 2015. It contains information from 224 diamond drillholes and 37 channel samples. The drilling was completed in two main campaigns. A previous owner drilled 56 holes between 1996 and 1998. Columbus completed an additional 171 holes from 2011 to November, 2014. The channel samples were all collected from surface outcrops between 1995 and 1997. SRK has previously reviewed the 1995 through 1998 exploration data and found it to be of sufficient quality to support an industry standard, resource estimation. All drilling, sampling and analytical work conducted by Columbus has followed industry standard procedures and includes quality assurance/quality control (QA/QC) protocols.

## 1.4 Mineral Processing and Metallurgical Testing

Bureau Veritas Commodities Canada Ltd. - Inspectorate Metallurgical Division (Inspectorate) was retained by Nordgold to perform metallurgical testing on samples from the Project located in north-west French Guiana. The test program was directed and supervised by Eric Olin from SRK Consulting (U.S.) Inc. The results of this metallurgical investigation are fully documented in Inspectorate's report, "Metallurgical Testing to Recover Gold and Silver from the Montagne d'Or Gold Project, French Guiana", March 30, 2015.

The test program was focused on the testing of two master composites formulated from available whole core intervals representing the Upper Felsic Zone (UFZ) and the Lower Favorable Zone (LFZ), as well as selected variability composites.

Three process options, including whole-ore cyanidation, a combination of gravity concentration followed by cyanidation of gravity tailing, and gravity concentration followed by gold flotation from the gravity tailing and cyanidation of the flotation concentrate, were investigated on two master composites, and the preferred process option and optimal conditions were further verified on ten variability test composites.

Table 1.4.1 provides a summary of estimated gold recoveries achievable by each of the process options tested. Gold recovery achievable by a process flowsheet that includes gravity concentration followed by cyanidation is estimated at 95% from the UFZ and LFZ zones and 94% from the saprolite zones.

Gold recovery from a process flowsheet that includes gravity concentration followed by gold flotation from the gravity tailings and cyanide leaching of the flotation concentrate is estimated at 90% for the UFZ and LFZ zones and 65% for the saprolite zones. Estimated gold recoveries have been reduced by a 2% adjustment factor to allow for gold and silver losses that will occur during commercial operation due to plant inefficiencies.

**Table 1.4.1: Summary of Estimated Gold Recoveries from Process Options Tested**

| Process Option | Calc. Head Au, g/t | Au Extraction % | Adjustment Factor | Au Recovery % |
|---|---|---|---|---|
| **Whole Ore Cyanidation** | | | | |
| UFZ Master Composite | 1.42 | 95 | 2 | 93 |
| LFZ Master Composite | 2.17 | 95 | 2 | 93 |
| **Gravity + Cyanidation** | | | | |
| UFZ Master Composite | 1.79 | 97 | 2 | 95 |
| LFZ Master Composite | 1.80 | 97 | 2 | 95 |
| Variability Composite (Average) | 2.13 | 96 | 2 | 94 |
| Saprolite | 0.97 | 96 | 2 | 94 |
| **Gravity + Flot + Cyan** | | | | |
| UFZ Master Composite | 1.75 | 91 | 2 | 89 |
| LFZ Master Composite | 1.78 | 93 | 2 | 91 |
| Variability Composite (Average) | 1.98 | 90 | 2 | 88 |
| Saprolite | 0.69 | 67 | 2 | 65 |

## 1.5 Mineral Resource Estimate

Gold mineralization is controlled mainly by structural fabric and lithology. The mineralization is localized in planar zones which have recurrent distribution and highly variable grades. Anomalous gold grades typically occur in zones 3 to 10 m wide which are separated by barren or lower grade zones 10 to 30 m wide. As part of the most recent drilling campaign, most of the historic core was re-logged to create a unified system of lithologic descriptions. This has resulted in a detailed, 3-D geologic model created by using Leapfrog Geo software. Lithologic control of mineralization is evident and SRK utilized four lithic types or groups which were estimated independently.

The Au capping level was chosen at 39 g/t resulted in 25 samples ranging from 40.1 g/t to 163 g/t being reduced to 39 g/t prior to compositing. This capping results in a net loss of 3% of all gold in the database. Compositing was completed in 3 m downhole lengths with no breaks at lithologic contacts.

Columbus constructed Leapfrog® software generated wireframe solids which enclose anomalous gold mineralization at a 0.3 g/t Au threshold. The grade estimation was conducted in eight domains. Four rock types/groups were used and each rock type/group was estimated independently both internal and external to the grade shell using only samples from the same domain. An Inverse Distance Weighting Squared ($IDW^2$) algorithm was used for the grade estimations.

Five techniques were used to evaluate the validity of the block model including; visual checks, overall model performance parameters, statistical comparison between composite and block grades, nearest neighbor comparisons and swath plots.

The Mineral Resources reported for the Montagne d'Or deposit are classified as Indicated and Inferred Mineral Resources, based primarily on drillhole spacing since all other supporting data is of good quality. Wire frame solids were constructed around the areas where the average drillhole spacing is approximately 50 m or less and these were used to assign the Indicated Mineral Resource classification. All blocks outside of these wireframes were classified as Inferred Mineral Resources.

The Montagne d'Or Mineral Resource statement is presented in Table 1.5.1. The resource is confined within a Whittle™ optimization pit shell and a cut-off grade CoG of 0.4 g/t Au applied. The pit shell and CoG assumes open-pit mining methods and is based on a mining cost of US$1.50/t, milling cost of US$15.00/t, administration cost of US$1.00/t, a gold price of US$1,300/oz., 90% gold recovery, gold refining cost of US$8.00/oz, and 5% NSR royalty. A 45° pit shell slope was used for bedrock and a 35° pit shell slope was used for saprolite. The reported Mineral Resources include material from all estimation domains.

**Table 1.5.1: Montagne d'Or Mineral Resource Statement as of April 11, 2015 SRK Consulting (U.S.), Inc.***

| Classification | Au Cut-Off (g/t) | Tonnes (M) | Au (g/t) | Contained Au (M oz) |
|---|---|---|---|---|
| Indicated | 0.40 | 83.24 | 1.455 | 3.893 |
| Inferred | 0.40 | 22.37 | 1.550 | 1.115 |

Note: Mineral resources are not ore reserves and do not have demonstrated economic viability. All figures rounded to reflect the relative accuracy of the estimates. Metal assays were capped where appropriate. Mineral Resources are reported based on a CoG of 0.4 g/t Au, and are reported inside a conceptual pit shell based on appropriate mining and processing costs and metal recoveries for oxide and sulfide material. CoGs are based on a mining cost of US$1.50/t, milling cost of US$15/t, administration cost of US$1.00/t, a gold price of US$1,300/oz., 90% gold recovery, gold refining cost of US$8/oz, and 5% NSR royalty.
Source: SRK, 2015

## 1.6 Conclusions and Recommendations

### 1.6.1 Geology and Resources

- Columbus has completed an industry standard exploration drilling program over an area of approximately 1 1/4 $km^2$;
- The results of the drilling have supported an industry standard resource estimation;
- Whittle™ pit shell optimizations host an Indicated Mineral Resource of 83 Mt at an average Au grade of 1.455 g/t containing 3.9 Moz of gold and an additional Inferred Mineral Resource of 22 Mt at an average Au grade of 1.550 g/t containing 1.1 Moz of gold;
- A multitask exploration drilling program is proposed. The program will target infill drilling in the areas of the proposed starter pit, infill drilling in the saprolite material and condemnation drilling in the potential areas of infrastructure;
- The infill drilling program would be on a 25 m x 50 m grid spacing in the proposed area of the current resource starter pit. The drillholes are proposed to range from 35 to 320 m in length. Many of the holes would be drilled by RC to the maximum depth achievable and then taken to final depth with core. A total of 17,750 m in 123 drillholes would be required; and
- The condemnation drilling program will cover three areas of infrastructure including, proposed plant site, proposed waste rock site and the proposed tailings facility. The condemnation drilling would be on a 55 m grid pattern and would consist of 75 m long inclined holes at -55 to the north or north east. A total of 4,900 m in 65 drillholes would be required.

### 1.6.2 Metallurgy

- The metallurgical test program was conducted on two master composites formulated from available whole core intervals representing the UFZ and the LFZ, as well as selected variability composites;
- Three process options, including whole-ore cyanidation, a combination of gravity concentration followed by cyanidation of gravity tailing, and gravity concentration followed by gold flotation from the gravity tailing and cyanidation of the flotation concentrate, were investigated on two master composites, and the preferred process option and optimal conditions were further verified on ten variability test composites;
- Processing by gravity concentration followed by cyanidation of the gravity tailings yielded the highest overall gold recoveries and was selected at the preferred process option. Gold recovery is projected at about 95% with this process option; and
- Additional metallurgical testing will be required as the project advances to the next phase of study.

# 2 Introduction

## 2.1 Terms of Reference and Purpose of the Report

This report was prepared as a National Instrument 43-101 Technical Report (Technical Report) on Updated Resources for Nordgold with Columbus by SRK on the Montagne d'Or Project located in French Guiana. Columbus is the Project owner/operator and is currently exploring the deposit under a option joint venture agreement with Nordgold. The details of the option joint venture area greement are discussed in Section 4.2. Nordgold has contracted with SRK for this technical study. The project is operated under a local enterprise named SOTRAPMAG (Société de Travaux Publiques et de Mines Aurifères de Guyane)( SOTRAPMAG) which is a 100% owned subsidiary of Columbus Gold. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in SRK's services, based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This report is intended for use by Columbus subject to the terms and conditions of its contract with SRK and relevant securities legislation. The contract permits Columbus to file this report as a Technical Report with Canadian securities regulatory authorities pursuant to NI 43-101, Standards of Disclosure for Mineral Projects. Except for the purposes legislated under provincial securities law, any other uses of this report by any third party is at that party's sole risk. The responsibility for this disclosure remains with Columbus. The user of this document should ensure that this is the most recent Technical Report for the property as it is not valid if a new Technical Report has been issued.

This report provides mineral resource estimates, and a classification of resources prepared in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves: Definitions and Guidelines, May 10, 2014.

## 2.2 Qualifications of Consultants (SRK)

The Consultants preparing this technical report are specialists in the fields of geology, exploration, mineral resource and mineral reserve estimation and classification, underground mining, geotechnical, environmental, permitting, metallurgical testing, mineral processing, processing design, capital and operating cost estimation, and mineral economics.

None of the Consultants or any associates employed in the preparation of this report has any beneficial interest in Nordgold or Columbus. The Consultants are not insiders, associates, or affiliates of Nordgold or Columbus. The results of this Technical Report are not dependent upon any prior agreements concerning the conclusions to be reached, nor are there any undisclosed understandings concerning any future business dealings between Nordgold or Columbus and the Consultants. The Consultants are being paid a fee for their work in accordance with normal professional consulting practice.

The following individuals, by virtue of their education, experience and professional association, are considered Qualified Persons (QP) as defined in the NI 43-101 standard, for this report, and are members in good standing of appropriate professional institutions. The QP's are responsible for specific sections as follows:

- Bart Stryhas, Principal Resource Geologist, is the QP responsible for background, geology and resource estimation Sections 2 to 12, 14 to 16, 18 to 24, and 26 to 28, and portions of Sections 1 and 25 summarized therefrom, of this Technical Report.
- Eric Olin, Principal Consultant (Metallurgy), is the QP responsible for mineral processing, metallurgy and recovery Sections 13 and 17, and portions of Sections 1 and 25 summarized therefrom, of this Technical Report.

## 2.3 Details of Inspection

Bart Stryhas, Bret Swanson and Mark Willow visited the Project site for three days on April 1-3, 2014. Over the three day visit, the group toured the general areas of mineralization, historic mining, drilling sites, reviewed existing infrastructure, observed the Columbus drill core and reviewed project data files with Columbus' and Nordgold's technical staff.

**Table 2.3.1: Site Visit Participants**

| Personnel | Company | Expertise | Date(s) of Visit | Details of Inspection |
|---|---|---|---|---|
| Bart Stryhas | SRK | Geology/Resources | April 1-3, 2014 | Drill Core/ Field Geology |
| Bret Swanson | SRK | Mining | April 1-3, 2014 | |
| Mark Willow | SRK | Environmental | April 1-3, 2014 | |

Source: SRK, 2015

## 2.4 Sources of Information

The sources of information include data and reports supplied by Columbus personnel as well as documents cited throughout the report and referenced in Section 27. The electronic database was compiled and transmitted by Columbus.

## 2.5 Effective Date

The effective date of this report is April 11, 2015. This is the date on which the final data files were received from Columbus. The most relevant data files were the drillhole database and the geologic model. In addition, the exchange rate used to describe royalties in Section 4.3 is effective as of this date.

## 2.6 Units of Measure

The metric system has been used throughout this report. Tonnes are metric of 1,000 kg, or 2,204.6 lb. All currency is in U.S. dollars (US$) unless otherwise stated. The Euro-US dollar conversion used in this report is based on an exchange rate of US$1.06:€1.00.

# 3 Reliance on Other Experts

The Consultant's opinion contained herein is based on information provided to the Consultants by Columbus throughout the course of the investigations. SRK has relied upon the work of other consultants in the project areas in support of this Technical Report.

SRK has relied on Columbus's legal representation to describe the:

- Geopolitical;
- Mineral Rights;
- Nature and Extent of Ownership, and
- Royalties, Agreements and Encumbrances.

The majority of the text included in Sections 4 through 11 is taken from previous technical reports, and SRK has referenced these citations where used. Portions of these sections have subsequently been modified by Columbus staff and reviewed by SRK for compliancy with NI 43-101.The Consultants used their experience to determine if the information from previous reports was suitable for inclusion in this technical report. This report includes technical information, which required subsequent calculations to derive subtotals, totals and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, the Consultants do not consider them to be material.

# 4 Property Description and Location

Montagne d’Or is located along the northern flank of the Dékou Dékou range. Montagne d’Or is part of the larger Paul Isnard Project (Project). The Project consists of eight mining concessions and two pending exploration permit applications covering a total area of 190 $km^2$, located in the commune of Saint-Laurent-du-Maroni, NW French Guiana. The Project also includes historic artisanal mining operations, exploration roads and drill pads, a core logging/storage facility and Camp Citron. The camp hosts a main cook shack/office building and approximately six bunkhouse/shower buildings.

## 4.1 Property Location

The Project area and mining concessions are located in the northwestern portion of French Guiana, South America (Figure 4.1.1). The project area extends from longitude 53° 53’ 52’’ W (UTM 178,475) to 54° 03’ 09’’ W (UTM 161,360), and latitude 4° 40’ 59’’ N (UTM 518,322) to 4° 51’ 03’’ N (UTM 536,922). Camp Citron, the base camp for the project, is located approximately 4 km northwest of the deposit.


Source: Columbus, 2015

**Figure 4.1.1: Paul Isnard Project General Location Map**

## 4.2 Mineral Titles

### 4.2.1 Geopolitical

French Guiana is both a Region and a Department of France and is subject to French laws, with certain modifications and differences that are applicable to the Départements d'Outre Mer (overseas departments). The Region is governed by the President of the Region. The Department is governed by the President of the Department. Both are elected by the people of French Guiana. There is an election scheduled for December 2015 that will elect only one President to govern the merged Region and Department. The local administration is governed under the direction of the Prefect, who is appointed by the President of France and is the representative of the French government. In overseas departments, the Prefect has more extensive powers than their counterpart in mainland France. Mining is a national matter presided over by the Prefect.

**SDOM Mining Legislation**

The President of the French Republic, Mr. Sarkozy (at the time of legislation), committed himself to a new comprehensive mining legislation in French Guiana following his rejection, in February 2008, of IAMGOLD's development application for the Camp Caiman gold deposit. The mining project demonstrated the difficulties and contradictions related to the compatibility of industrial development and the protection of the environment in the Department.

The new mining legislation, referred to as the *Schéma Départemental D'Orientation Minière de la Guyane* (SDOM), was drafted by representatives of the national government of France in the Prefecture of French Guiana following broad consultation with regional communities, the economic players concerned, environmental protection organizations, trade unions, the State and local and regional bodies competent in the fields of natural and human environment, biodiversity and geology. The final SDOM legislation was approved by decree (*décret n$^o$ 2011-2106*) on December 30, 2011, by the *Conseil d'État* (State Council), the highest administrative court in France, and went into effect on January 1, 2012.

The legislation was created with the dual objectives of encouraging economic development of the mining industry in French Guiana while protecting its environment and provides incentive, including security of land tenure and clear guidelines to mining development and environmental conditions and restrictions, to serious and environmentally responsible mining companies while inhibiting environmentally damaging illegal mining activities.

Under the SDOM legislation, the territory of French Guiana is divided into four land use classifications, defined as Zones 0, 1, 2 and 3 (the SDOM Zones), that clearly outline areas where the possibility of prospecting and mining are defined in accordance with Article L.621-1 of the *code minier* (Mining Code). The classification takes into consideration the necessity to protect sensitive natural environments, landscapes, sites and populations, a balanced management of the land and the natural resources, economic interests, and sustainable development of the mining resources, within the limits of current knowledge of the biodiversity and the mineral wealth. The areas where mining activity are permitted represents 55% of the territory:

- Zone 0: Banned for prospecting and mining.
- Zone 1: Open to airborne surveys, underground mining authorized subject to conditions.

- Zone 2: Open to prospecting, underground and open pit mining authorized subject to conditions.
- Zone 3: Open to prospecting and underground and open pit mining.

The Montagne d'Or gold deposit is located within an area classified as a favorable zonation (Zone 2), where all prospecting and mining activity is authorized, although subject to conditions as it lies in proximity to the Lucifer Dékou Dékou biological reserves (RBI LDD).

Conditions to mining in Zone 2, which in actual fact would be applicable to large scale commercial mining operations anywhere in French Guiana include:

- Demonstration of a viable mineral deposit;
- Adherence to a Charter of Good Practices approved by the State representatives;
- Completion of an Environmental Impact Study and Reclamation Plan; and
- Requirements in Zone 2 can include additional reclamation or environmental investigations as may be required for the public interest, on or off site.

**Lucifer and Dékou Dékou Biological Reserve**

The initial Lucifer Dékou-Dékou domanial biological reserve (RBD LDD) was created in 1995 over an area covering 110,300 hectares.

Following the implementation of the SDOM legislation, an Order by the Ministry of *l'écologie, du dévelopement durable et de l'énergie* (EDDE) and the Ministry of *l'agriculture, de l'agroalimentaire et de la forêt* (METL), referred to as the '*Arrêté du 27 juillet 2012'*, was issued in July, 2012, to create and establish the boundaries of the RBI LDD. The biological reserve covers 64,373 hectares and is administered by the Office National des Forêts (ONF).

The principal objectives of the biological reserve is to permit the evolution of the natural forest ecosystem, the preservation of biological diversity and improving scientific knowledge on the Lucifer and the Dékou Dékou massifs. To attain these goals human activity within the biological reserve are regulated and logging, prospecting and mining are prohibited.

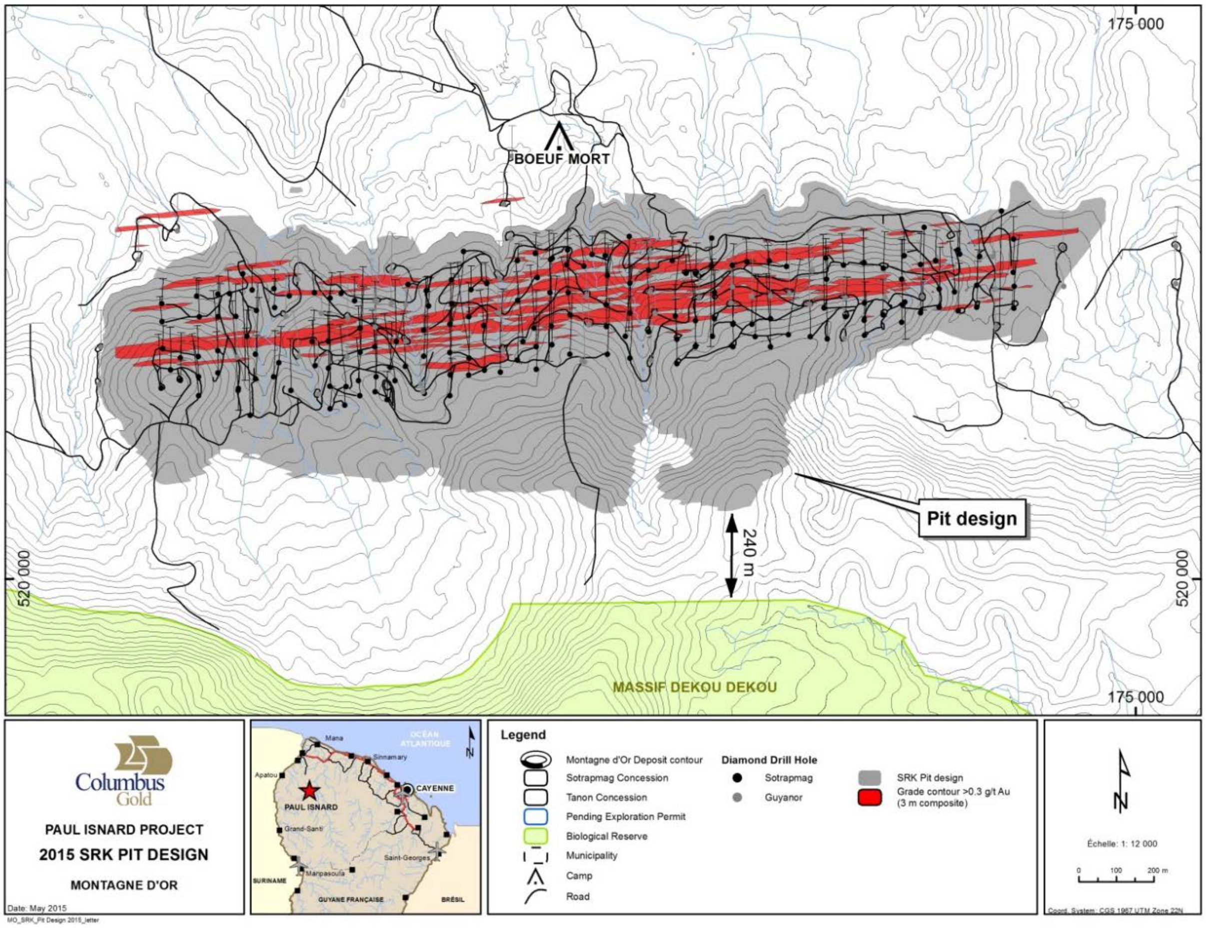
The RBI LDD is separated into two domains located immediately north and east and south of the Paul Isnard concessions, referred to as Lucifer and Dékou Dékou, respectively.

To the south of the Montagne d'Or mineral resource, the boundary of the Dékou Dékou portion of the biological reserve is defined from west to east by:

- The 420 m elevation line over a distance of 5.5 km;
- A 0.8 km straight line oriented 107$^{o}$ azimuth starting at the 420 m elevation extending to the 505 m elevation and then rejoining the 420 m elevation; and
- Extending southeast along the Apollon creek bed over a distance of 2.8 km.

The location of the Dékou Dékou biological reserve with respect to the potential resource pit outline is shown in Figure 4.2.1.1. There is currently a 240 m set-back between the reserve boundary and the potential pit outline.

The southern portion of the concession C02/46 that falls within the RBI LLD are open to airborne surveys and underground mining (Zone 1).




Source: Columbus, 2015

**Figure 4.2.1.1: Location of the Potential Resource Pit Outline and Biological Reserve**

## 4.2.2 Mineral Rights and Properties

Mineral exploration and mining are subject to the provisions of the *code minier*, which specifies that the State can grant to an operator a right to prospect or exploit the mineral resources over a specified area and period.

Special regulations have been established for the Department of French Guiana to take into account certain distinctions specific to this territory (law no98-297 of April 21, 1998). In addition to the *code minier*, that include Exclusive Research Permits (PER) for prospecting and Concessions for mining, the regulations concerning French Guiana provide for Mining Research Authorizations (ARM), in areas managed by the ONF, Exploitation Authorizations (AEX) and Exploitation Permits (PEX).

Mineral rights and mining are administered by the *Direction de l'environnement*, *de l'aménagement et du logement* (DEAL) under the authority of the Prefect. Their locations are reported in UTM, World Geodetic System (WGS) 84, Zone 22.

**Exclusive Research Permit (PER)**

In general, the PER is the initial permit application to conduct prospecting.

- Maximum area: No restriction. The area has to fit reasonably with the exploration objectives and the geological context.
- Dimensions & Form: No restrictions, as long as protected areas are not included within the area requested.
- Maximum period: 15 years. Initial application is for 5 years, twice renewable for up to 5 years. Surface area can be reduced by 50% in each renewal application. Following the extensions it is required to apply for a Concession or Exploitation Permit.
- Restriction: The initial application is open to competitor bidding if it covers an area greater than 50 $km^2$.
- Requirements: Financial commitments are based on the exploration program and expenditures proposed in the mining title application, which need to be in accordance with the surface area of the mining title. Conditions of renewal are based on the completion of the financial commitments in the corresponding period.

**Exploitation Permits**

Mining in French Guiana is permitted under the following permits:

- Concession;
- Exploitation Permit (PEX); and
- Exploitation Authorization (AEX).

PEX and AEX are exclusive to the *départements d'Outre-Mer*, such as French Guiana.

Concession

- Maximum area: No restriction.
- Dimensions & Form: No restrictions.
- Period: 50 years. Renewable by 25-year tranches if the mining operations are active at time of renewal. All the concessions, in French Guiana, will expire by December 31st, 2018. On the concessions, there are no financial commitments. However, for a concession to be able to be renewed, its owner has to prove a gold production (from itself or from any company legally exploiting gold on the concession) on the concession before December 31st, 2018.
- Restriction: Open to competitor bidding unless it arises from a PEX or PER.

Exploitation Permit (PEX)

- Specific disposition: Medium-scale alluvial and small-scale vein-type mining.
- Maximum area: No restriction.
- Dimensions & Form: No restrictions.
- Maximum Period: 15 years. Initial application is for 5 years, twice renewable for up to 5 years.
- Restriction: The initial application is open to competitor bidding unless it arises from a PER or if the total surface area is less of equal to 50 $km^2$.

Exploitation Authorization (AEX)

- Specific disposition: Small-scale artisanal mining, mainly for alluvial exploitations, sometimes for primary gold in saprolite.
- Maximum area: 1 $km^2$.
- Dimensions & Form: 1 km x 1 km or 0.5 km x 2 km.
- Maximum Period: 8 years. Initial application is for 4 years, once renewable for up to 4 years.
- Restrictions: Maximum of 3 AEX by *département d'Outre-Mer* in a same 4-year period. An AEX can be issued over an area covered by a PER, Concession or PEX with consent of the holder of these titles and as long as they are active. The holder of the PER, Concession or PEX loses all mineral rights over the area covered by the AEX.

The Project is composed of eight mining concessions which cover an area of approximately 135 $km^2$ (13,500 ha). The concessions are listed in Table 4.2.2.1 and shown in Figure 4.2.2.1.

**Table 4.2.2.1: Land Tenure of the Paul Isnard Project**

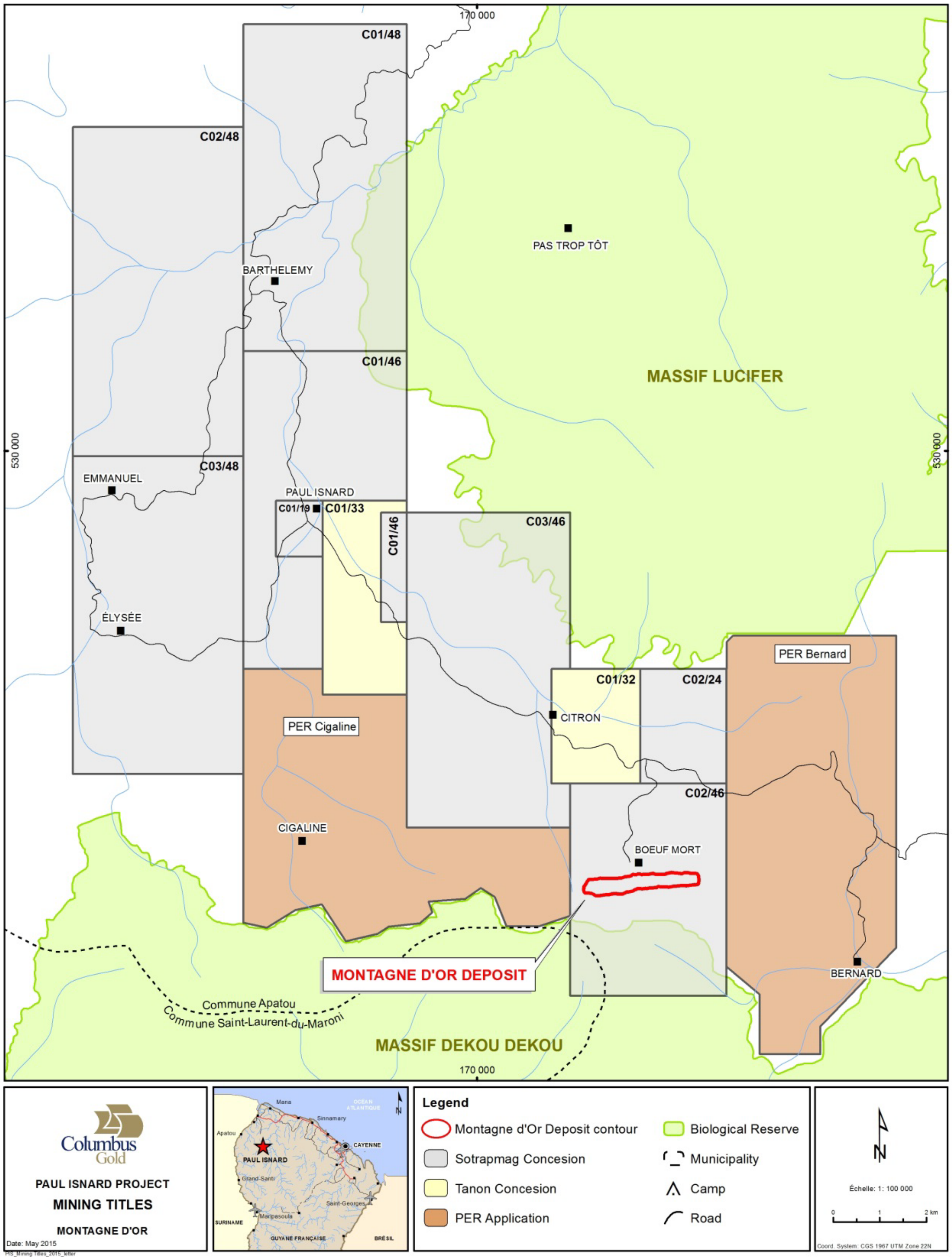
| # Mining Title | Type | Surface $km^2$ | Transfer to Sotrapmag | Expiry Date |
|---|---|---|---|---|
| C01/19 | Concession | 1.200 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C02/24 | Concession | 4.471 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C01/46 | Concession | 17.272 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C02/46 | Concession | 15.075 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C03/46 | Concession | 22.470 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C01/48 | Concession | 24.500 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C02/48 | Concession | 25.375 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| C03/48 | Concession | 24.469 | Decree : 12/27/1995 (JO : 12/29/1995) | 12/31/2018 |
| **Total** | | **134.832** | | |

Source: Columbus, 2015

**ONF Rights**

As most of the ground in French Guiana belongs to the French State and is covered by the equatorial rainforest, the ONF was designated to manage the private domain of the State. Therefore, any occupation of the ground, in forested areas, is submitted to an authorization by the ONF (camps, access roads, etc.). Subject to application, the ONF grants land use permits or "*Convention d'Occupation Temporaire du Domaine Privé de l'Etat pour activités minières*" (COTAM) to mining title holders. SOTRAPMAG holds a COTAM dated April 24, 2009, valid until December 31, 2018, for the use of the road from Apatou Crossing to Citron (60 km) and for the surface area of Citron camp and airstrip. The COTAM has annual fees based on the surface area of the deforested land, kilometers of roads, and surface occupied. As an example, for the Paul Isnard project, SOTRAPMAG pays annual fees to the ONF for the use of the road from Apatou Crossing to Citron (5,400 €), for the surface area of Citron camp and airstrip (3,700 €), as well as for the opening of new access roads and drill pads (variable, but about 800 € for 2014). A *COTAM* will be necessary, in the future, for mine infrastructures and wastes and tailings sites.

Access to the Paul Isnard mining concessions is guaranteed by the existence of the mining titles under the right of access to the mineral resource ("*accès à la ressource*").




Source: Columbus, 2015

**Figure 4.2.2.1: Location of Columbus Concessions and PER Applications**

### 4.2.3 Nature and Extent of Issuer's Interest

Columbus entered into an Option Agreement dated November 30, 2010, with Auplata S.A., SOTRAPMAG SAS, and Pelican Venture SAS, which was amended on May 25, 2011, June 6, 2011, June 15, 2011, and December 5, 2011 (as amended, the "Auplata Option Agreement"). Under the Auplata Option Agreement, Columbus acquired on April 12, 2012 a beneficial 100% interest in SOTRAPMAG, which holds the 8 mining concessions and a pending PEX application comprising the Paul Isnard Project. The PEX application, submitted by Euro Ressources SA in 2010, was annulled and replaced by a two PER applications submitted by SOTRAPMAG SAS in December 2013.

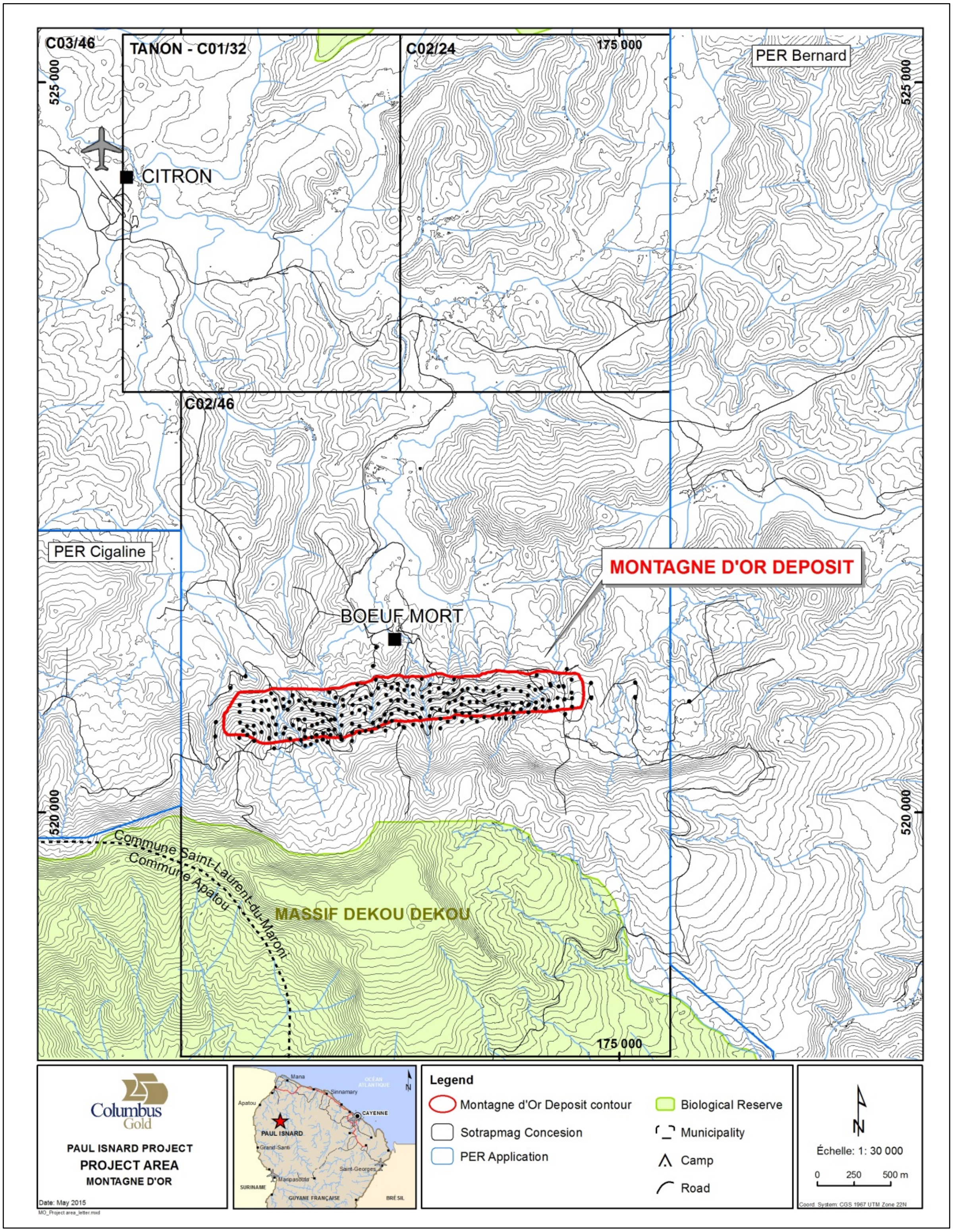
On January 16 2013 Columbus and Auplata S.A. signed a share purchase agreement which assigned 100% of the legal project ownership to Columbus pursuant to Columbus' acquisition of 100% of the outstanding shares of SOTRAPMAG.

On March 13, 2014, Columbus Gold and Nordgold signed the definitive option agreement pursuant to which Nordgold has the right to earn a 50.01% interest in the Paul Isnard Project and the pending PER applications (54.3 $km^2$) within a three year option period terminating in March 2017.

### 4.2.4 Location of Mineralization and Facilities

The Montagne d'Or exploration area is located approximately halfway up the steep northern slope of the Dékou-Dékou Mountain within mineral concession C02/46 (215) shown in Figure 4.2.4.1. The mineralization and proposed mining and processing facilities, with the exception of the man camp, are within mineral concession C02/46.

The camp for the current exploration and the proposed mining operation could be located at Citron Camp. Citron Camp is within mineral concessions C01/46 held by SOTRAPMAG and C01/32 held by Tanon S.A. (Tanon). The access road crosses two Tanon held mineral concessions. The road crosses Tanon held mineral concessions C01/32 between the mineralized zone and Citron Camp and mineral concession C01/33 north of Citron Camp (Figure 4.2.2.1). Under the mining code, SOTRAPMAG has rights to any access roads leading to the Paul Isnard concessions.




Source: Columbus, 2015

**Figure 4.2.4.1: Paul Isnard Project General Site Map**

## 4.3 Royalties, Agreements and Encumbrances

The Paul Isnard Project is subject to a 1.0% net smelter returns royalty payable to Sandstorm Gold Ltd.

There is also a net smelter returns royalty of 1.8% on the first 2 Moz ounces of gold produced and 0.9% on the next 3 Moz of gold produced on the Paul Isnard Project payable to Euro Ressources SA, an 86%-owned indirect subsidiary of IAMGOLD Corporation.

The royalty payable in French Guiana is for distribution to the local communes (towns), of €683.50 (US$724.51)/kg. In addition, there is a Communal tax of €132 (US$139.92)/kg and Departmental tax of €26.30 (US$27.88)/kg (2014). The Euro-US dollar conversion in this paragraph is based on an exchange rate of US$1.06: €1.00.

The Paul Isnard Project is also subject to reclamation of previous mining works, as described in Section 4.4.1, to a maximum expenditure of €350,000. The reclamation work is currently in progress and is expected to be completed in September 2015.

## 4.4 Environmental Liabilities and Permitting

### 4.4.1 Environmental Liabilities

The Montagne d'Or project area is an intermittently active exploration property centered in dense tropical rain forest. Exploration activities require access road and drill pad construction, trenching, water management features, as well as construction of worker camps. Environmental liabilities resulting from previous and ongoing exploration activities are fairly limited due to the high precipitation and rapid natural rehabilitation that occurs in the rainforest. Holders of exploration permits (see below) are required by law to reclaim worked areas, control stormwater and potential sedimentation of downstream surface water resources, and are strictly prohibited from using mercury. These conditions are monitored closely by the government.

Potential environmental liabilities of particular interest to Columbus are mainly associated with previous artisanal placer mining that occurs over much of the project area. Impacts associated with these unauthorized operations include deforestation adjacent to streams, severe downstream sedimentation issues, and potential mercury contamination from stream-side beneficiation operations. Auplata, and by extension Columbus, negotiated an agreement with French regulatory authorities to dedicate up to €350,000 (US$371,000) to reclamation of previous mining sites.

### 4.4.2 Mining in French Guiana

In 2012, the National Government of France approved new legislation promoting the development of the mining industry French Guiana. The legislation, known as the Schéma Départemental d'Orientation Minière (SDOM), was created with the objectives of encouraging economic development of the mining industry in French Guiana while protecting its environment. To accomplish these objectives, the SDOM provides increased security of land tenure, clarifies mineral development guidelines and environmental conditions and restrictions, and assigns lands in French Guiana zones that define limitations on mining activity:

- Zone 0: Banned for exploration and mining.
- Zone 1: Open to aerial surveys, underground mining authorized subject to conditions.

- Zone 2: Open to exploration, underground and open pit mining authorized subject to conditions.
- Zone 3: Open to exploration and underground and open pit mining.

Most of the Paul Isnard concession areas, including the Montagne d'Or gold deposit, lie within Zone 2. Some of the conditions to mining in Zone 2 include:

- Demonstration of a viable mineral deposit;
- Completion of an Environmental Impact Study and Reclamation Plan; and
- Possible additional reclamation or environmental investigations, as may be required for the public interest, on or off site.

In addition to the land restrictions presented by the SDOM, the Project is located adjacent to a nature reserve, the Réserve Biologique Domaniale Lucifer Dékou-Dékou, managed by the ONF.. Its Management Plan from the ONF is yet to be ratified, so there is little guidance or decisions regarding the use of land and allowable activities within the reserve. The boundaries of this reserve overlap four of the eight Paul Isnard mineral concessions however only one of these concessions is important to the project. Since these concessions already exist, and there has been continued exploration and mining activity in the area for over 100 years, the ONF has agreed to create several zones within the reserve boundaries where mining is permitted. The Montagne d'Or deposit itself is within a zone where open pit mining is permitted and the outer limit of the resource pit shell is located approximately 240 meters from the reserve boundary..

### 4.4.3 Required Permits and Status

French Guiana's (Guiana) mining regime is governed by the legislative and regulatory regime applicable to the French mainland with the exception of certain legal and regulatory provisions which are specific to it in order to take into account particular characteristics and constraints of this overseas territory. Reformation of the Mining Code, however, was proposed in 2012, but has not yet been approved or promulgated. As such, the discussion herewith remains focused on the current permitting requirements. Additional information regarding the proposed reforms is provided later in the text.

French Guiana developed a Departmental Mining Plan in 2011 which "defines the terms and conditions applicable to mining prospection [exploration], as well as the terms of the implementation and exploitation of land mining sites" with a view on economic sustainability as well as environmental protection. The general provisions of the Mining Code provide for two types of mining titles: the exclusive exploration permit ("permis exclusif de recherche" or PER) for the exploration phase, and the concession (Concession) for the exploitation phase. A PER grants exclusive rights to carry out exploration activities within a specified exploration area. It is granted for an initial maximum period of five years, but can be renewed twice. A Concession confers on its holder an exclusive right, within the boundaries of such Concession, to explore and exploit the mineral resources that it covers. It is assignable and leasable, but cannot be mortgaged, and has an initial maximum term of 50 years and may be subject to successive 25-year renewal periods. Both the issuance of a PER and the granting of a Concession include public disclosure and participation in the permitting process.

In addition, small-scale mining, including most lawful alluvial operations, are carried out through exploitation authorizations ("authorisation d'exploitation" or AEX) granted for areas no larger than 1 $km^2$. There are no current AEX operations within the Paul Isnard Project area.

The Paul Isnard Project does not currently include any PER. Instead, the Project is comprised of eight mining concessions covering approximately 135 $km^2$. The mining concessions, combined with appropriate permits, allow large-scale mine operations and are valid until December 31, 2018 with potential renewal for a maximum of 25 years conditional upon a number of conditions, not the least of which is proving economic viability. The Project does include a pending application for an exclusive exploitation permit ("permis d'exploitation" or PEX) covering an additional 14.4 $km^2$ outside of the concession areas. The PEX, combined with appropriate operating permits, also provides for medium- to large-scale mine operations, and is granted for five years with two potential and maximum renewals of five years each. The Paul Isnard mining concessions, and the pending PEX, require quarterly reporting to the State but carry no defined financial commitments for maintenance.

### 4.4.4 Mine Code Reformation

The original proposal and legislation for reformation of the Mining Code, announced in 2012, failed to garner sufficient support for passage late last year. However, that legislation is currently being revisited, and is anticipated to pass, possibly by the end of this year. While the proposals maintain much of the "French mining model" which is based on the ownership of the subsoil by the State (beneath 30 m) and the granting of permits for the exploration or exploitation of mineral resources, the new legislation is likely focus on the following areas for change:

- Increased environmental protection;
- Improved worker safety and public safety;
- Protection of mining operators legal position and tenures;
- Simplification of administrative procedures; and
- Inclusion and strengthening of public participation and transparency in the permitting process.

The draft legislation also proposes modifications to the current tax structure, though no specifics are currently available.

## 4.5 Other Significant Factors and Risks

There are no known factors or risks that affect access, title or right or ability to perform work on the property.

# 5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

***Section 5 has been excerpted from the Coffey 2014 Technical Report. Standardizations have been made to suite the format of this report. Changes made by SRK are indicated by the use of brackets [ ] or in sentences containing "SRK". Some spelling has been modified.***

## 5.1 Accessibility

Montagne d'Or is located in the north-western portion of French Guiana, not far from the Maroni River that forms the border with Surinam. The property is accessible throughout the year by charter aircraft and seasonally by road. At Camp Citron, where the base camp is located at a distance of approximately 4 km from the Prospect area, there is a 500 m grass runway that can accommodate small aircraft. Alternatively, a helicopter charter service is available from Cayenne.

The flight from Cayenne to Paul Isnard takes approximately 55 minutes.

A forest road leads for a distance of approximately 125 km from Saint-Laurent-du-Maroni on the Maroni River to the Montagne d'Or prospect area. The first 65 km from Saint-Laurent-du-Maroni to Croisée d'Apatou is maintained by the State and supports all season travel. SOTRAPMAG has an exclusive right to use of the final 60 km of the road. This road section is currently being maintained by Auplata to accommodate normal vehicle access for servicing the site.

Several roads that crisscross the mining concessions provide reasonable access for larger pickup trucks. Four wheel ATVs are used where access is prohibitive to pickup trucks. Access from Cayenne to the project area is possible either by small plane or by helicopter (Figure 5.1.1), and takes approximately 50 to 55 minutes flying time to Citron.

Source: Columbus, 2015

**Figure 5.1.1: Picture of Helipad/airstrip at Camp Citron**

## 5.2 Climate

The climate is equatorial, with daytime temperatures between 29°C and 33°C, decreasing to 19°C to 23°C at night. There are two wet seasons; the main period is typically from April to the end of August, and the lesser period lasts from mid-November to mid-March. Average annual rainfall is in excess of 2,000 mm with a minimum monthly rainfall of 50 mm. Humidity is constantly high and typically ranges between 78% and 92%. The operating season is year-round.

## 5.3 Resources and Infrastructure

Skilled, semi-skilled and unskilled labor is readily available in Cayenne, with most professional and technical personnel being trained in Metropolitan France. Unskilled labor is also available in Saint-Laurent-du-Maroni. As French Guiana is a Department of France, French labor laws apply, resulting in relatively high salaries and restrictive employment contracts when compared to the neighboring countries of Surinam and Brazil.

Camp Citron infrastructures are 100% owned by SOTRAPMAG. A land use permit for the camp area and airstrip was obtained by Euro on 24 April 2009. The permit is valid until December 31, 2018, on expiry date of the concessions (ONF-Euro_Convention_2009-04-24).

Sufficiency of surface rights for mining operations, the availability and sources of power, water, mining personnel, potential tailings storage areas, potential waste disposal areas, heap leach pad areas, and potential processing plant sites have not yet been established for this exploration project.

## 5.4 Physiography

Most of the region is covered by a thick canopy of primary and secondary tropical forest. The larger valleys have been extensively worked by alluvial miners in the past and are generally covered by thinner secondary forest or grassy-scrub and bamboo. Thick areas of bamboo are also present in many streams especially on the steeper slopes and in areas of old mine workings. The mean elevation is approximately 130 m ASL.

The general relief of the region is dominated by three geomorphological features:

- The east - west trending Massif Dékou-Dékou Range;
- The southwest - northeast trending duricrust plateau of Montagne Lucifer; and
- The northwest - southeast drainage system of the Roche River.

Montagne d'Or occupies the northern flank of the Dékou Dékou Range, of which Montagne d'Or forms the northern flank.

There are numerous broad valleys, many of which have been exploited for their alluvial gold deposits. These are separated by areas of moderately rugged to more rounded hilly relief and often deeply incised valleys.

# 6 History

***Section 6 has been excerpted from the Coffey 2014 Technical Report. Standardizations have been made to suite the format of this report. Changes made by SRK are indicated by the use of brackets [ ] or in sentences containing "SRK". Some spelling has been modified.***

## 6.1 Prior Ownership and Exploration

The Paul Isnard concessions have been a regional center of alluvial and colluvial gold production since 1873 with some minor underground development in a few places. Beginning about 1890 bucket type dredging was undertaken and was replaced by dragline operations in 1949. Due to government permitting issues, little if any work was undertaken except by small illegal miners from 1950 to 1965 when placer mining recommenced and continued until approximately 1997.

The area was previously explored by the Bureau Minier Guyanais (BMG) and later the Bureau de Recherches Géologiques et Minières (BRGM), the French Geological Survey. This work confirmed the alluvial mining potential of the region and also located the primary Montagne d'Or prospect as a result of a regional geochemical program in 1976. This was not recognized as such until the data was reinterpreted in 1984. The BRGM undertook detailed surficial geochemical work and geological mapping.

The Paul Isnard Mine was started in 1956 by a company called SERMIG; gravel mining commenced in 1966 and continued for 20 years through an American company. Recovery was through an amalgamation plant and must have been poor. From 1986, a new owner (Pichet-Driss) obtained control, improved the process and operated the mine until 1993. SOTRAPMAG was involved in the gravel mining operation as a partner with the SGM, CERMI and Pichet-Driss.

In May 1993 Golden Star Resources Ltd endeavored to acquire title to the mine properties of the Paul Isnard Mine off SOTRAPMAG who was the owner of the mine and carried out a two-week evaluation of the operation. Total production from 1987 to 1993 was at this stage reported at 5,142 oz of gold and 354 oz of silver. This would roughly indicate a 7% average silver content of the gold doré.

Intensive exploration did not begin until 1994 when Guyanor Ressources S.A. ("Guyanor" approximately 70% owned by Golden Star Resources) had acquired the concessions and undertook regional scale remote sensing (LandSat, geophysics), geological examinations and geochemical surveys. Guyanor acquired the property in October 1994 through the 100% acquisition of the mining company SOTRAPMAG (Société de Travaux Publiques et de Mines Aurifères de Guyane). Guyanor is registered in French Guiana with the right to explore deposits of gold, precious metals, base metals, and precious stones.

When Guyanor purchased SOTRAPMAG, it paid off an interest of Alcatel Alsthom Compagnie Générale d'Electricité (ALCATEL) in a primary deposit in the area to the BRGM while the company La Source Développement (LaSource) received an initial 25% participating interest. It is reported that LaSource did decide not to participate as a minority partner and that its interest was subsequently diluted.

From June 1996 until May 1998 exploration on the property was operated as a joint venture between SOTRAPMAG and Asarco Guyane Française with LaSource as a non-contributing partner. A PER was granted by Ministerial Decree (Official Bull. dated November 30, 1999) 100% to Guyanor (later named Euro Ressources) on 26 November 1999 for a period of three years from 1 December 1999 to 30 November 2002. Following the formation of the Joint Venture with Asarco and La Source, detailed geology, geochemistry and geophysics was completed along with 56 drillholes totaling for 10,916 m. In September 1999 the LaSource interest is reported as approximately 10% and that when it falls to below 10% it will convert to a 2.5% net proceeds royalty.

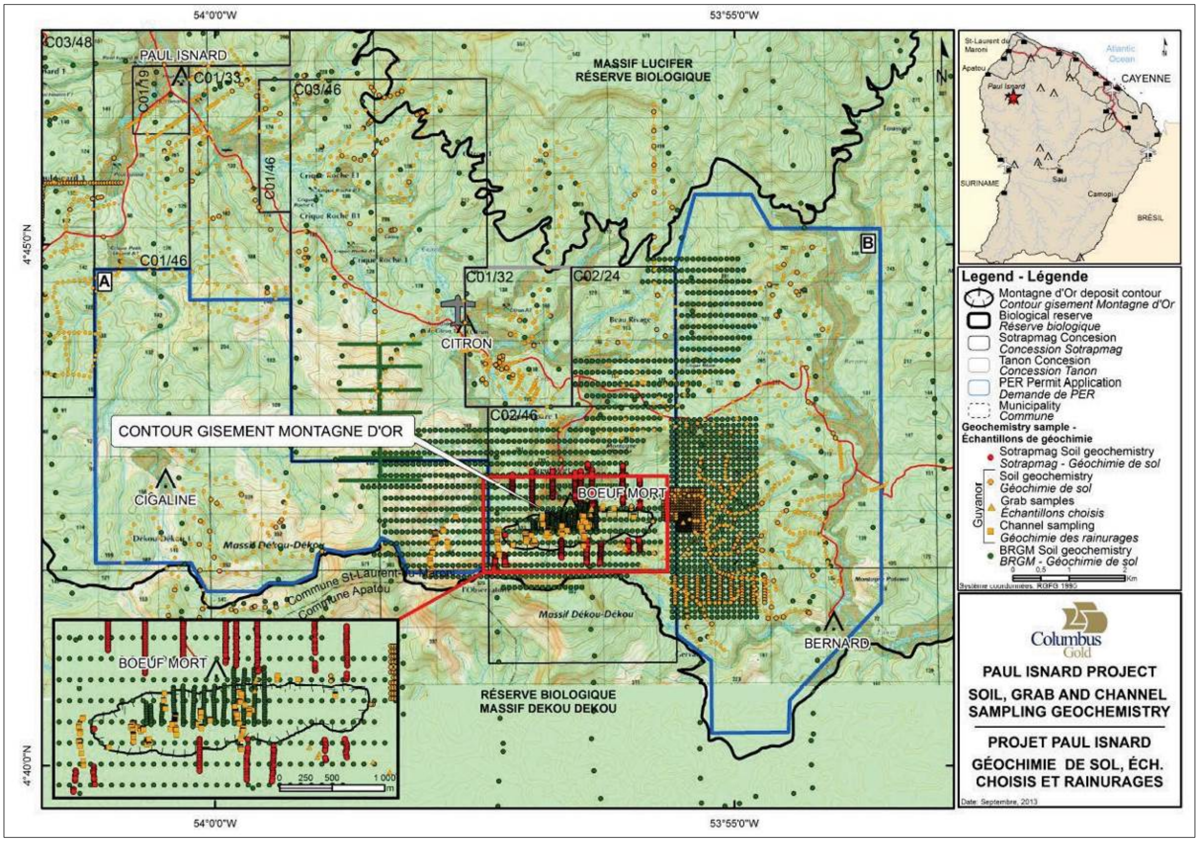
In 2001 a program of drilling was completed by Guyanor in conjunction with a JV agreement signed between Guyanor and Rio Tinto Mining and Exploration Ltd. Rio Tinto however concluded that the deposit did not have sufficient potential (more than 10 Moz) within saprolitic and near surface material to be mined by open pit methods followed by a cyanide recovery process.

Input to this study was mainly a re-interpretation of all available structural, geological and geophysical data and a study of older drill core obtained by Élysée (six diamond drillholes for 598.45 m) and Apollon (three diamond drillholes for 405.40 m), a regional geochemical soil program covering areas that were not previously covered (total of 1,058 soil samples) and a follow-up soil geochemistry and ground geophysics program (69 km) investigating the located anomalies. Selected anomalies were followed-up in 2001 with a limited diamond drilling program (Élysée six additional drillholes for 636.50 m, Paul Isnard three drillholes for 358.95 m, Citron three diamond drillholes for 343.50 m). One drillhole at Paul Isnard (Montagne d'Or) intersected a 7.0 m mineralized interval at 1.03 g/t Au. After completion of the program, Rio Tinto decided to withdraw from the JV.

Guyanor has carried out exploration activities in the areas at and around Montagne d'Or since 1994. Diamond drilling by Guyanor from 1996 (in JV with Asarco) to 1998 resulted in a total of 56 drillholes for 10,916 m. Guyanor also drilled 18 holes in 2001 in a JV with Rio Tinto and in 2007 a company by the name of Euro drilled one additional drillhole at Paul Isnard. Guyanor became Euro Ressources.

Until the property was acquired by Columbus in 2010, work done largely consisted of desktop evaluation of the resource potential and possible economic viability, and little additional exploration work was undertaken.

Since before 1900 up to around 1950, small scale alluvial mining has taken place in the area. This was followed by large scale alluvial mining from 1965 while the BRGM undertook geological mapping and regional geochemistry from 1930 to around 2000. Guyanor started work on the property in 1994. A regional overview of the various soil sampling, grab sampling and channel sampling programs is provided by the map in Figure 6.1.1.




Source: Coffey, 2014

**Figure 6.1.1: Plan Map Overview of Historic Exploration Campaigns**

## 6.2 Historical Mineral Resource Estimations

There have been five previous CIM compliant Mineral Resource estimations made of the Montagne d'Or prospect. These are summarized in Table 6.2.1. SRK notes the historical resources are not current mineral resources; they have been superseded by the current SRK mineral resource estimate discussed in Section 14 of this Technical Report. SRK has not done sufficient work to classify the historic estimates as current. The historical resources are provided here for information purposes only.

**Table 6.2.1: Previous Resource Estimates for the Montagne d'Or Deposit**

| Year | Source | CIM Compliant | Resource Classification | Cut-off (g/t) | Tonnes (M) | Au (g/t) | Contained Au oz (M) |
|---|---|---|---|---|---|---|---|
| 2004 | RSG Global | Yes | Inferred | 0.8 | 60.5 | 1.5 | 2.9 |
| 2008 | SRK | Yes | Inferred | 0.5 | 33.2 | 1.7 | 2.0 |
| 2011 | SRK | Yes | Inferred | 0.4 | 36.7 | 1.6 | 1.9 |
| 2012 | Coffey Mining (Canada) | Yes | Inferred | 0.3 | 115.2 | 1.44 | 5.3 |
| 2014 | Coffey Mining (Australia) | Yes | Inferred | 0.3 | 169.2 | 0.9 | 4.6 |

Source: SRK, 2015

# 7 Geological Setting and Mineralization

***Section 7 has been partially excerpted from the Coffey 2014 Technical Report and Updated by Columbus current to this report. Standardizations have been made to suite the format of this report.***

The Montagne d'Or deposit is composed of a bimodal felsic and mafic igneous units with lesser volcaniclastics towards the base of the sequence. The units strike east-northeast and dip steeply south. The eastern portion contains a preponderance of mafic volcanics relative to felsic volcanics. All geological units have been strongly deformed, as evidenced by a penetrative S1 foliation that locally transposes S0 and in places is mylonitic. The volcanic-plutonic package that hosts the deposit is tightly to isoclinally folded. The S1 foliation is constant throughout the section, striking on average 084° with an average 72°S dip. The intensity of deformation varies significantly over the distance of a few meters. The project area is cross cut by post deformation diabase dikes that were apparently emplaced within northeast striking shears, faults or fractures that formed during a regional transcurrent tectonic event.

In general, the Montagne d'Or deposit consists of a number of tabular mineralized bodies within laminated, mainly felsic metavolcanic rocks. Mineralization has been encountered over a strike length of almost 2,500 m and to a vertical depth of at least 200 m. The mineralization is open at depth, along strike and internally between widely spaced holes.

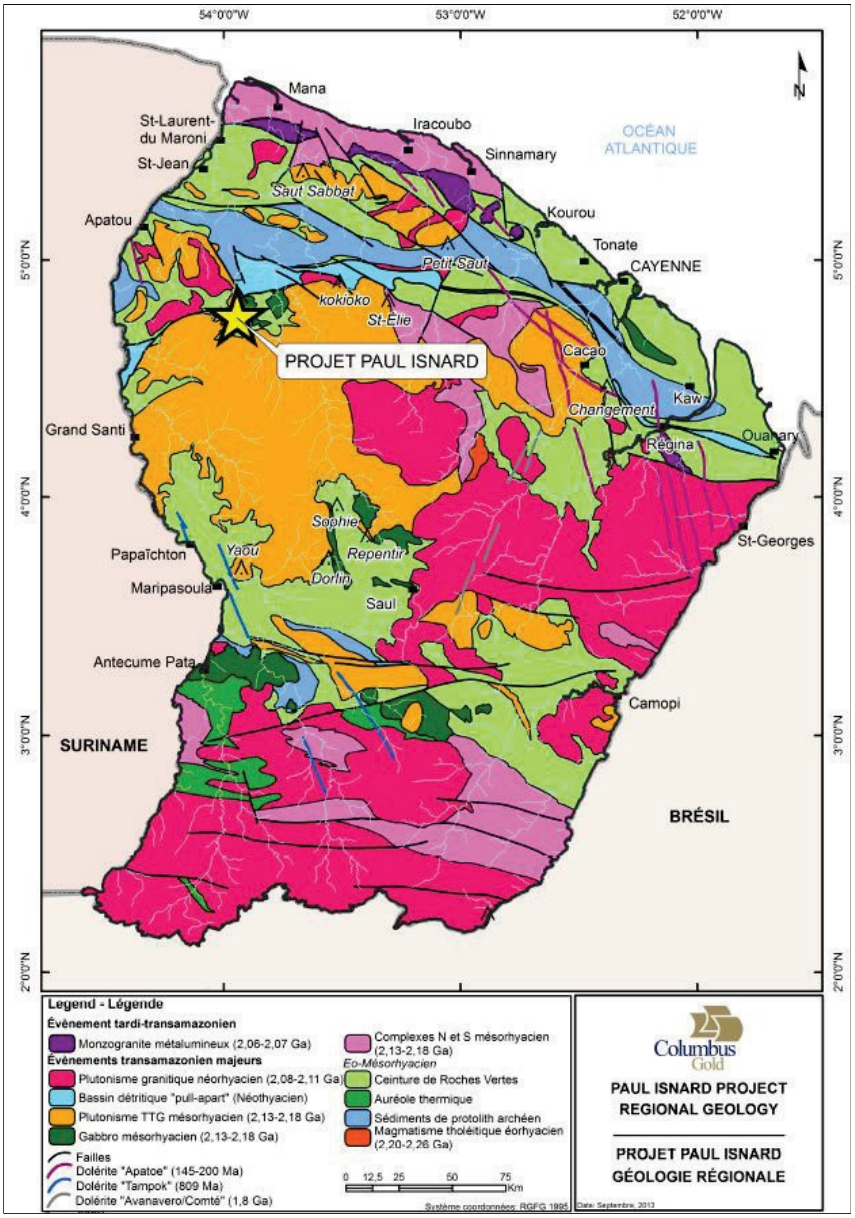
The mineralization appears as narrow elongated higher grade lenses within broader zones of low grade but anomalous mineralization (0.25 to 0.4g/t Au). The main area of gold mineralization occurs in a series of generally east-northeast striking parallel zones with overall dimensions of 2,200 m x 400 m wide and to at least 200 m vertical depth. However, gold has been encountered outside the main zone of mineralization in the host rocks over a strike length of at least 3,500 m. Several distinct anomalous mineralized domains can be recognized that are separated by barren intercalated mafic and felsic rocks. Mineralization consists of semi-massive sulfide bands, as sulfidic stringers and as disseminated sulfides. Visible gold is present but rarely observed; preliminary mineralogical work suggests that it occurs along micro-fractures and on sulfide grain boundaries.

## 7.1 Regional Geology

The following is based mainly on work published by Milesi et al (2003) and Delors et al (2001), and on the most recent geological and structural interpretations carried out by a team from the Université du Québec à Montréal (UQÀM) and published in 2014 (Giraud et al, 2014). The latter studies also use and discuss historic and important geological interpretations by Vanderhaeghe et al (1998), and Franklin et al (2001). An earlier publication important for understanding the evolution of the geological interpretation of the French Guiana geology is the exploration report by Suter prepared for Guyanor in 1999.

The Paul Isnard concessions occur within the Guiana Shield, a large (approximately 900,000 $km^2$) segment of the Amazonian Craton of South America (Figure 7.1.1). The majority of the Guiana Shield formed during Proterozoic periods of intense magmatism, metamorphism and deformation that culminated in the Transamazonian tectono-thermal event of 2.1 to 1.9 Ga. The low-grade, volcanic-sedimentary greenstone sequences and affiliated granite intrusives that comprise the shield yield U-Pb age dates between 2.25 Ga and 2.08 Ga.

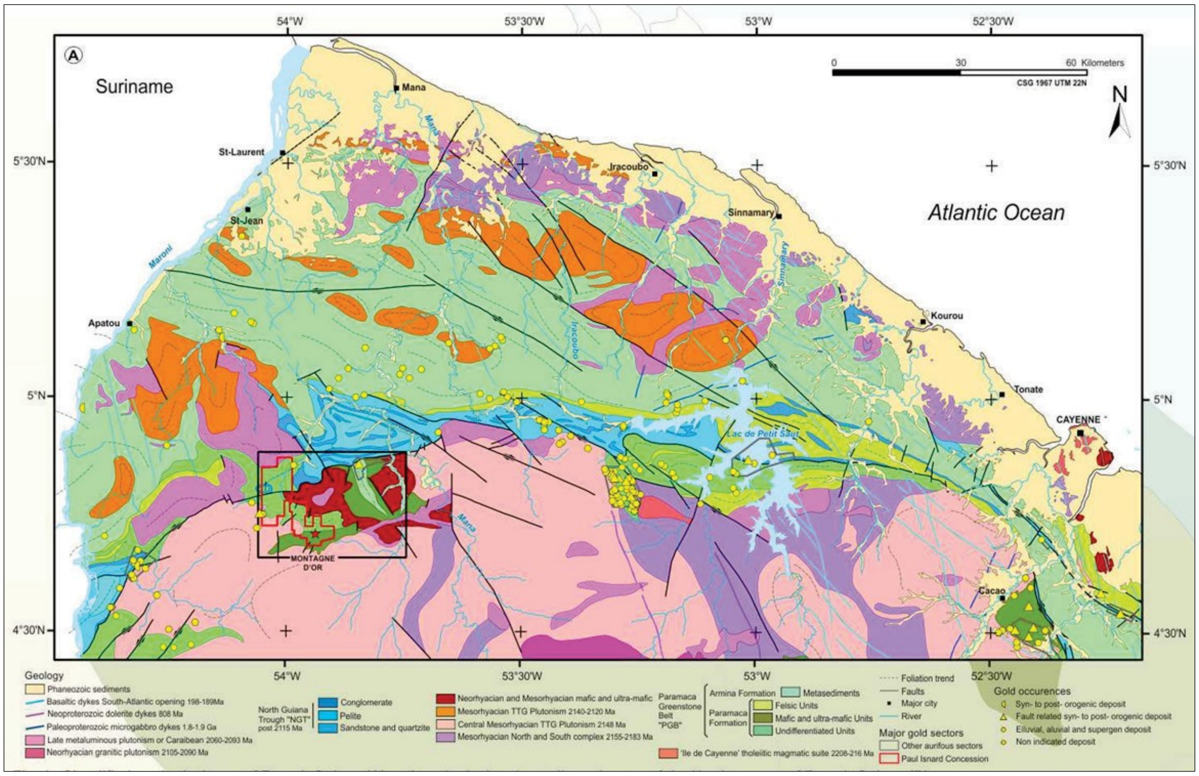
Major structural features include the Central Guiana Shear Zone (CGSZ) and the North Guiana Trough (Sillon Nord Guyanais, NGT). The CGSZ is a large-scale ductile shear zone, extending from French Guiana westerly through central Suriname and north-central Guyana. The NGT is interpreted to be a sinistral strike-slip "pull-apart basin" formed during one of the major tectonic stages of the Transamazonian Orogeny (Voicu et al, 2001).




Source: Coffey, 2014

**Figure 7.1.1: Large Scale Geological Map of French Guyana**

The greenstone belts of French Guiana are divided into two major groups. The northern group is associated with the NGT and includes the Lower Proterozoic Paramaca Greenstone Belt (PGB), a formation consisting of volcanic, volcaniclastic and sedimentary units. The PGB trends roughly from the west to the east through British Guiana, Dutch Guiana (Surinam) and French Guiana (Figure 7.1.2).




Source: Coffey, 2014

**Figure 7.1.2: Large Scale Overview of the Geology of Northern French Guiana, showing the location of the Paul Isnard Project**

Together with intrusive complexes of tonalite, trondhjemite and granodiorite, the PGB forms the Guiana Shield which was connected during the Paleozoic to the West African Shield (after Guiraud, Jébrak and Tremblay, UQÀM, April 2014). The PGB is interpreted as the remnant of a volcanic island-arc sequence that was tectonically deformed during the Transamazonian Orogeny, interpreted to be the result of plate convergence between the West African and the Guiana Shields.

This PGB occurs extensively across northern French Guiana, striking N110°E and hosting a number of gold deposits including Paul Isnard, Camp Caiman, St. Elie, Koolhoven and Rosebel in Surinam. The southern group is associated with the CGSZ and extends from Surinam through French Guiana. It includes sedimentary rocks of the Lower Orapu Formation and volcanic-sedimentary units of the Arima Formation (2.11 to 2.09 Ga), which unconformably overlie volcanic units of the PGB and the granite-gneiss complex of the Guianese Massif Central (2.3 to 2.2 Ga and 2.13 to 2.08 Ga). This southern group hosts gold mineralization at Benzdorp in Surinam, Yaou and Dorlin in French Guiana, and numerous other smaller workings. Most of the remainder of French Guiana is composed of the Lower Proterozoic granite-gneiss metamorphic complex of the Guianese Massif Central, and a central belt of Paramaca volcanic, volcaniclastic, and sedimentary lithologies.

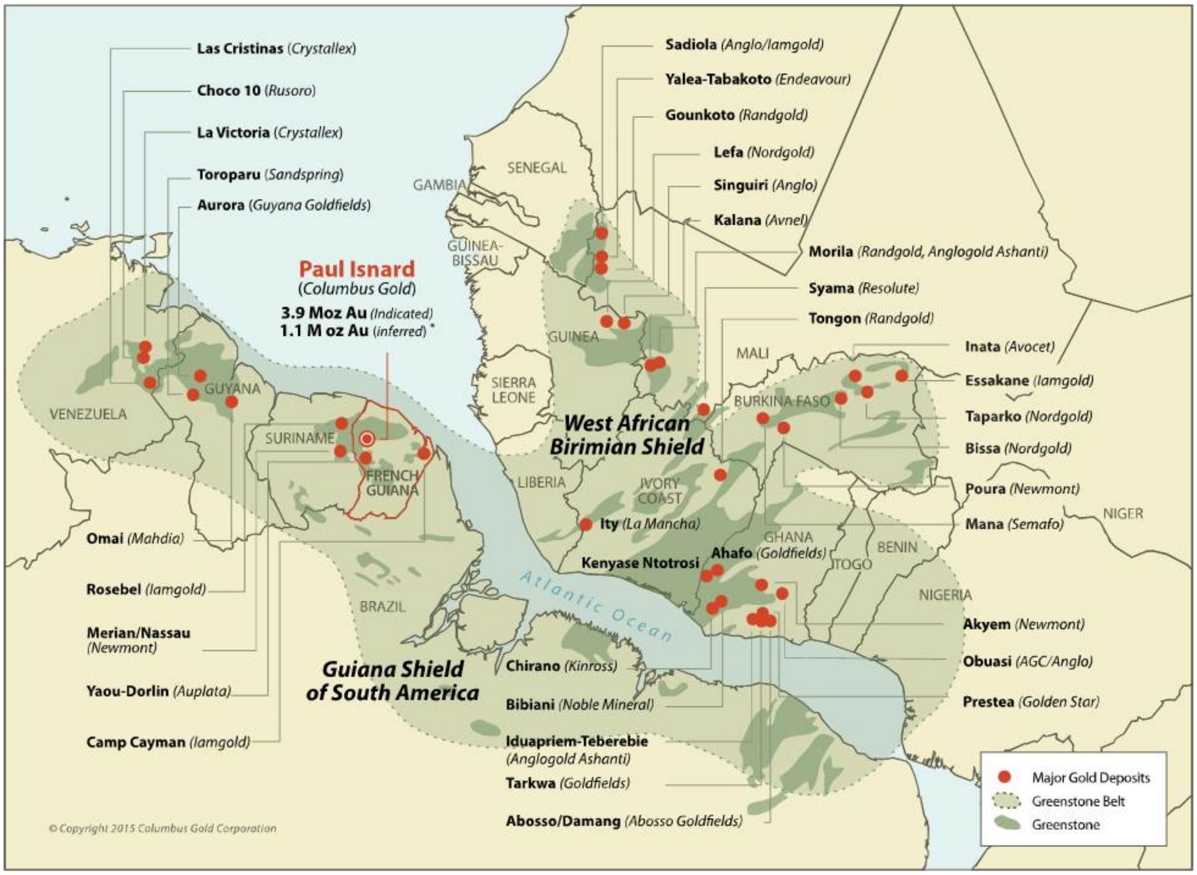
The northern and southern domains of the PGB are separated by the intrusions of tonalite, trondhjemite and granodiorite (TTG). Along its northern boundary, at a distance of approximately

15 km from Montagne d'Or, the PGB is bounded by sandstones and conglomerates of the NGT. Along the southern margin, the Greenstone Belt is in contact with large intrusive domes of TTG.

The PGB is locally limited to the south and west by regionally extensive post-orogenic granites and to the east by inferred high-grade metamorphic rocks of migmatitic and granitic gneiss. To the north, a narrow band of Paramaca-Armina Formation is unconformably overlain by the Upper Detrital Series (Ensemble Detrique Superieur EDS), silici-clastic sediments comprised of the Bonidoro, Orapu and Rosebel Formations. The EDS are surrounded by gabbro and granite and are interpreted as having been deposited in pull-apart basins associated with the NGT.

The felsic-mafic metavolcanic rocks of the PGB are overlain by the Armina Formation, a series of alternating sedimentary rocks (sandstones, graywackes and pelites); however, this formation has not been intersected by drilling in the project area. The BRGM obtained a radiometric age in the project area of 2,152 ± 8 Ma from a rhyolite which provides a possible date for the volcanic series however the age of the mineralization is unknown. Locally, gabbro intrusions occur which have yielded radiometric dates of 2,150 Ma to 2,145 Ma, similar to the TTG.

The PGB and EDS are probable equivalents or correlatives of respectively the Birimian and Tarkwaian sedimentary sequences of the West African Shield and may have been co-extensive prior to the separation of Gondwanaland in the Mesozoic (Figure 7.1.3). The Paul Isnard Project lies within the northern PGB and is comprised of mafic and felsic metavolcanic rocks of the Paramaca Formation.




Source: Columbus, 2015

**Figure 7.1.3: Map Showing Correlation of the Guiana Shield with the West African Birimian Shield**

# 7.2 Property Geology

## 7.2.1 General

Montagne d'Or occurs within a bimodal felsic-mafic series of Proterozoic volcanic rocks. The gold mineralization is hosted within a 400 m thick, tightly to isoclinally folded sequence of predominantly felsic and lesser mafic volcanic rocks. The units strike east-northeast, dip steeply south and are exposed on the northern slopes of Dékou-Dékou Mountain.

The eastern portion contains dominantly mafic volcanics with only minor amounts of felsic volcanics. The mineralized units have been strongly deformed, as evidenced by a penetrative S1 foliation that locally transposes S0 and in places is mylonitic. The orientation of the S1 foliation is constant throughout the section, striking on average 084° with an average 72°S dip. The intensity of deformation varies significantly over the distance of a few meters. The deposit is cross cut by post deformation diabase dikes.

The volcanic complex of Montagne d'Or is bounded in the north by granite and gneiss and is bounded along its southern margin by amphibolites that were thrust over the volcanic rocks. A sliver of detrital metasedimentary rocks is locally wedged beneath the overthrust amphibolites. The metavolcanic rocks have metamorphosed to greenschist grade.

The entire region has undergone Tertiary age lateritic weathering which resulted in a saprolite cover of varying thickness and in which variable lateral movements have taken place.

### 7.2.2 Lithology

The Montagne d'Or deposit is hosted within a tightly to isoclinally folded, steeply south dipping lithological package consisting of felsic and mafic metavolcanic rocks that are assigned to the PGB. The mafic metavolcanic rocks were previously divided into two units, a Lower Mafic Unit that lay to the north of the deposit and an Upper Mafic Unit that comprised the eastern part of the deposit (Coffey, 2014). Here, a single mafic metavolcanic unit is interpreted (Figure 7.2.2.1). The grouping of both of the previously defined mafic units into a single unit is justified by the paucity of data that are available for the region to the north of the deposit. The metavolcanic package is intruded by three distinct felsic to intermediate plutonic units that host only minor amounts of gold; from oldest to youngest these are granodiorite, quartz-feldspar porphyry and feldspar porphyry. Quartz-carbonate veins occur throughout the deposit but do not contain significant mineralization.

To the north of the deposit, the metavolcanic rocks are bounded by granite. On the southern side of the Montagne d'Or deposit, the metavolcanic host rocks are structurally overlain by a metasedimentary package consisting of quartzites, black shales and pelitic and graphitic schists. That metasedimentary package is in turn structurally overlain on its southern side by an amphibolite unit.

The metavolcanic and metasedimentary units underwent greenschist grade peak metamorphic conditions. Whole-rock geochemistry data show that the felsic lithologies have a calc-alkaline chemistry and were likely deposited in an arc or back-arc basin environment. Whole rock compositions range between granite and granodiorite (Suter, 1999; GoldFields 2001).

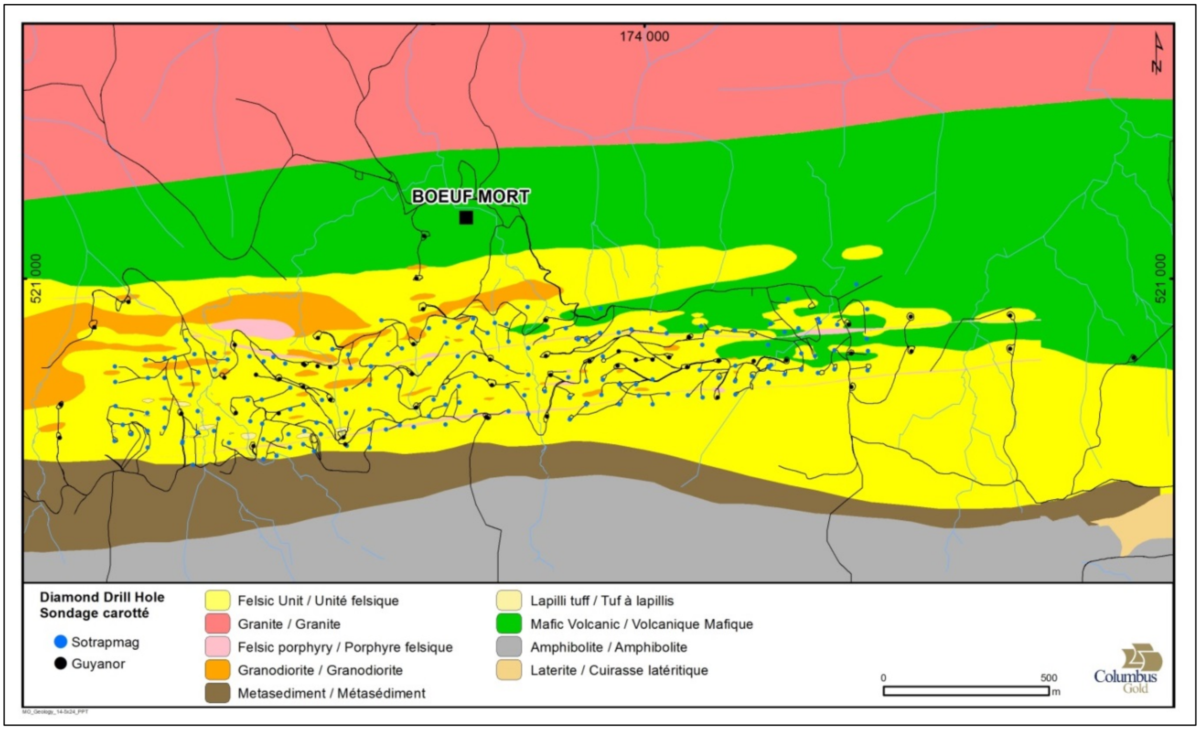
All units described above are cross-cut by a series of northeast striking diabase dikes.

Over 80% of the mineralization at the Montagne d'Or deposit is hosted by felsic metavolcanic units, mainly the Felsic tuff unit as defined here.

The tightly folded metavolcanic and plutonic rocks that represent the geology of the deposit can be assigned to the following principal units, listed from oldest to youngest, and that are described in the following paragraphs:

- Mafic metavolcanics;
- Felsic tuff;
- Lapilli tuff;
- Granodiorite;
- Quartz-feldspar porphyry; and
- Feldspar porphyry.

A schematic of the local geology of the Montagne d'Or prospect is shown in Figure 7.2.2.1.




Source: Columbus, 2015

**Figure 7.2.2.1: Schematic Overview of Main Local Geological Units**

## Mafic Metavolcanics

This unit occurs predominantly in the eastern portion of the deposit where it is tightly infolded with the felsic tuff unit. The mafic metavolcanics may locally be stratigraphically intercalated with the felsic tuffs. The rocks consist of alternating sequences of mafic flows, intermediate to mafic tuffs and mafic dikes. The flows are generally non-schistose, fine grained, massive, locally feldspar phyric, weakly to moderately magnetic, and dark-grey to black in color. Locally observed vesicular and hyalopilitic zones have been interpreted as evidence for a flow origin for the bulk of the unit.

The mafic dikes that are included in this unit are very fine grained and slightly chloritized along their margins. The dike contacts are slightly oblique to schistosity. They are deformed, indicating emplacement early in the geological evolution of the deposit and they are thought to represent synvolcanic dikes and sills petrogenetically related to mafic flows. The dikes have very poor lateral continuity.

The mafic metavolcanic unit may represent part of a bimodal volcanic complex that could include the felsic extrusive units or they may be part of an older crustal section upon which the felsic tuff and the Lapilli tuff would have been deposited. Ongoing geochemical studies should provide more information on the petrogenetic origins of the different metavolcanic units.

## Felsic Tuff

The felsic tuff unit consists predominantly of rhyolitic to dacitic rocks many of which preserve a fine lamination that suggests an origin as pyroclastic deposits. It is likely that rhyolitic and dacitic flows also make up a significant proportion of the unit. The groundmass is essentially quartz, feldspar and sericite. The rock is light grey in color and it is generally strongly foliated. Quartz phenocrysts represent up to 10% and they often preserve euhedral bipyramidal shapes. The phenocrysts are embedded in a holocrystalline matrix of fine-grained quartz-feldspar-biotite-(sericite-chlorite). Primary magnetite is often lacking. Locally the quartz phenocrysts are flattened and stretched, with a distinctive blue tint. Pressure shadows at the tips of the deformed phenocrysts may be filled with fibrous quartz and / or sulfide minerals, principally pyrite.

Over 80% of the mineralization at the Montagne d'Or prospect is hosted in the felsic tuff unit.

**Lapilli tuff**

The Lapilli tuff unit consists of rocks of similar composition to the felsic tuff unit but with quartzo-feldspathic masses (lapilli) hosted within the rhyolitic to dacitic rock matrix. The bulk of the Lapilli tuff unit occurs in the southern part of the Montagne d'Or deposit, close to the sheared contact with the metasedimentary unit. Franklin (1999) suggested that a "felsic lapilli tuff" unit would represent a coarse basal sequence of an ash flow tuff sequence.

**Granodiorite**

The Granodiorite unit is composed of variably deformed, medium to coarse grained rock the main constituents of which are quartz-feldspar-biotite. Much of the unit is more or less equigranular although sub-rounded quartz and euhedral feldspar phenocrysts are common and are sometimes enclosed within a finer grained groundmass giving a porphyritic texture. The rock is light gray but locally is has a gray to cream color due to sericitization and possibly some albitic and silicic alteration as well. Where the rock is strongly altered the primary texture is largely obliterated.

**Quartz-feldspar porphyry**

This unit has a mineralogy that is similar to the Granodiorite unit from which it differs in color and texture. The Quartz-feldspar porphyry is light gray to white and contains a large proportion of euhedral to subhedral phenocrysts of both quartz and feldspar. This unit might be a porphyritic facies of the Granodiorite unit; however, it tends to form homogeneous intervals of several meters in drill core and it is here assigned to its own unit.

**Feldspar porphyry**

The Feldspar porphyry unit forms two dikes that are documented to cross-cut the Mafic volcanic, Felsic tuff and Granodiorite units. The rock is of intermediate to felsic composition with a dark grey color and abundant, euhedral to subhedral feldspar phenocrysts. The rock can also contain a small proportion of blue quartz phenocrysts locally. The texture is invariably porphyritic and it can be strongly sheared, suggesting the dikes may have been emplaced within active shear zones.

**Quartz-carbonate veins**

Quartz-carbonate veins vary in thickness from the millimeter to meter scales. They are observed to cross cut the principal tectonic S1 foliation and are also deformed and folded, hence they are interpreted to have formed syn-orogenically. The veins are not generally associated with mineralization. Within mafic flows and intrusions, they occur as white, meter scale veins that cross-cut lithologic layering. The quartz veins within the felsic units are thin and are white or blue-grey in color.

## Alteration

Gold mineralization at the Montagne d'Or deposit is accompanied by pervasive alteration which includes sericite, secondary biotite (generally retrograded to chlorite) and secondary K-feldspar with locally associated quartz. Alteration products are the result of partial replacement of all lithologies due to reactions with the Fe and sulfide rich mineralizing fluids. The predominant additions to the rock geochemistry were sulfur and iron, as well as potassium, gold, and base metals, with a concomitant removal of sodium and calcium. The precipitation mechanism for gold was likely direct interaction of hydrothermal fluids with the country rocks.

Sericite is the dominant alteration phase in the shallower part of the drillholes, from approximately 40 to 120 m down-hole depth. It transitions into secondary biotite below 150 m. The most pervasive alteration is dominantly a phyllic assemblage. This includes quartz-sericite-pyrite and veinlet-controlled potassic assemblages of secondary biotite, and associated pervasive secondary K-feldspar. A less common, propylitic assemblage consists of chlorite-epidote-calcite. Veinlet assemblages include; quartz-pyrite-pyrrhotite-chalcopyrite, secondary biotite-pyrite-pyrrhotite, and magnetite-pyrrhotite-chalcopyrite-quartz-chlorite with minor amounts of red garnet. Chloritization occurs as a pervasive alteration of mafic units, and as millimeter-scale veinlets within felsic lithologies. The chlorite is Fe-rich, in contrast to Mg-rich chlorite typically associated with VMS type alteration. There is no documented correlation between chloritization and gold content. There is, however, a weak correlation between "hyperchlorite" zones and gold mineralization. The hyperchlorite zones are typically deficient in gold but commonly located adjacent to strongly auriferous zones. The prominent addition to the mafic rocks is $Fe^{3+}$, as well as gold. This is in part due to addition of sulfide, and perhaps to formation of Fe-rich chlorite. The addition of $K_2O$, as either sericite, secondary biotite, or secondary K-feldspar is also present. Alteration is typically strongest at the margins of the mineralized zones.

Chlorite alteration within mafic and intermediate units may include some secondary biotite. Zonation of peripheral Pb-Zn disposed about an Au-Cu center is also suggestive of a porphyry-type system. Late stage, narrow quartz veins are planar and cross cut the foliation and mineralized veinlets. They typically have a broad selvage of carbonate-chlorite alteration.

Hyperchlorite alteration zones at Montagne d'Or are composed of variably chloritized portions of nearly all lithologies. They occur predominantly in the mafic volcanic units, intermittently in the felsic units and rarely in mafic intrusive units. The mineralogical and textural characteristics of the zones are quite similar in both mafic and felsic units. The hyperchlorite alteration zones are composed of well foliated biotite (with incipient chlorite replacement), and locally contain a calc-silicate-rich assembly of actinolite, garnet, quartz, calcite-dolomite and magnetite + pyrite, chalcopyrite and pyrrhotite. The magnetite within this assemblage appears to be hydrothermal, and some magnetite rich intervals with sulfides can be highly auriferous. These zones are interpreted as reflecting primary mineralization as opposed to post-mineralization processes.

The edges of the felsic tuff unit are characterized by chlorite veining. Quartz phenocrysts are preserved while most of the primary textures are destroyed, particularly within central parts. Sulfide rich zones up to 50% can be associated with the chloritic alteration. Some rocks logged as mafic tuff may actually represent highly chloritized felsic lithologies. Visual discrimination of hydrothermal and metamorphic chlorite is very difficult.

Silicification is fairly pervasive in all volcanic units. Within the center of the Montagne d'Or prospect, less silicified units tend to have a higher sulfide content.

Sericitization is a major and widespread alteration feature within the felsic units. It has been interpreted as a later overprinting alteration stage on an earlier secondary K-feldspar. There is no documented association between sericitic alteration and gold content. However, the early BRGM regional geochemistry showed that K and Ba are elevated proximal to faults and shear systems. This feature in time provided the pathfinder to the Montagne d'Or prospect gold mineralization.

Carbonate alteration occurs within felsic rocks as fine stringers and replacements. Within mafic units, calcite development is more pervasive, occurring as massive replacement within rhythmically banded tuffs, and as carbonate-chlorite or quartz-carbonate veinlets. It is difficult to separate the hydrothermal alteration carbonates from that derived by regional metamorphic processes. No correlation has been noted between carbonate alteration and gold content.

### 7.2.3 Structure

The Paul Isnard Project area has experienced two distinct deformational events. The first involved ductile deformation during the Lower Proterozoic accretionary arc tectonism that formed the Guiana Shield. The second is a more brittle deformation event associated with the faulting within the NGT.

The first phase of regional deformation was associated with a regional northeast-southwest compression that led to the development of the pervasive S1 schistosity that strikes 080° to 100° and that dips steeply south. At the Montagne d'Or deposit, the average strike of S1 is 084° and the average dip is 72°S. This principal deformation event postdates mineralization as evidenced by the highly deformed sulfide fabric. However, at the Montagne d'Or, the crystallization of sulfides with pressure shadows at the tips of deformed phenocrysts indicates that some sulfide may have been remobilized during the tectonic event or that a second sulfide deposition event may have been syn-deformational.

Regionally, the development of the S1 schistosity was accompanied by Upper Greenschist Facies and Lower Amphibolite Facies metamorphism, locally associated with the emplacement of granitic plutons and migmatization. At the Paul Isnard project, S1 is associated with the deformation event that resulted in the very tight to isoclinal folding of the Montagne d'Or deposit and also in the thrusting of the amphibolite unit over the deposit.

The second phase of regional deformation postdates the EDS sediments and is related to sinistral transcurrent tectonism, marking the contact between the NGT and PGB. As a result of the second deformation, the earlier S1 schistosity is locally crenulated. A weak S2 fabric is characterized by a spaced cleavage, which strikes 060°. At the Montagne d'Or deposit, late diabase dikes have a preferred strike orientation between 060° and 065°, sub-parallel to S2, suggesting they were emplaced with shears, faults or fractures that had formed during the transcurrent tectonic event.

Regionally, a well-developed set of faults and fractures with four principal orientations were also developed and these may also be expressed at the scale of the Paul Isnard project. The relative intensity of these brittle structures listed from strongest to weakest are:

- North-south (48%);
- Northeast-southwest (28%);
- Northwest-southeast (16%); and

- East-west (7%).

## 7.3 Mineralization

The Montagne d'Or prospect consists of a family of tabular mineralized bodies that form closely-spaced sub-parallel east-northeast (084°) striking and steeply (72°) south-dipping mineralized zones. Mineralization has been encountered over a strike length of more than 2,500 m and to a vertical depth of at least 200 m. Only a small portion of the gold mineralization has been subjected to upper level oxidation. The significant fine-grained gold mineralization is principally affiliated with sulfide veins and masses within fresh country rock that begins at shallow depths.

Historically, on a macroscopic scale, two significant styles of gold mineralization have been recognized although they show a gradational relationship between each other:

- Semi-massive sulfide (SMS) with gold mineralization, and
- Sulfides in disseminated stringers with gold mineralization.

SMS was a term coined by previous operators and was used to support a "VMS" type model for the mineralization. It is characterized by a high sulfide content (>20%) and occurs over intervals ranging from tens of centimeters to up to 4 m. This mineralization was later interpreted to represent zones of thicker, deformed and transposed sulfide ± quartz-rich veins and a denser distribution of disseminated sulfide as compared to that of the disseminated type.

The SMS also includes sulfide-rich breccia dykes, which host rolled and milled clasts of host rock within a ductily deformed pyrite-chalcopyrite-pyrrhotite matrix. In addition, bornite is present, and minor amounts of arsenopyrite have been identified petrographically. There is a clear correlation between sulfide veinlets and sulfide-rich breccia zones and high gold grades. Relatively minor amounts of total sulfide (i.e., disseminated + vein and veinlet + breccia – hosted sulfide representing 2% to 5% total rock volume), locally resulting in significant although erratic, high gold concentrations, commonly attain values of tens of grams per tonne gold over standard 1 m sample intervals.

Disseminated mineralization is characterized by the presence of finely disseminated to finely fracture controlled sulfides, chiefly pyrite but with lessor and locally important chalcopyrite and pyrrhotite.

Close inspection of core and outcrop indicate that gold associated with this style of mineralization is in part controlled by the abundance of fine sulfide-quartz veinlets and fracture fillings which have been strongly (isoclinally) folded, sheared and transposed parallel to the S1 fabric. Grades for this mineralization type are dependent upon disseminated sulfide and sulfide-quartz veinlet density, but are generally low, in the 0.5 g/t Au to 3 g/t Au range over sample intervals which average approximately 1 m in length.

Mineralization is hosted by felsic, mafic and intercalated mafic/felsic rocks to varying degrees. However, approximately 80% of the gold mineralization in the deposit occurs within the more felsic units, mainly the Felsic tuff unit.

The mineralization appears as elongated lenses of higher grade material within broader zones of low grade but anomalous mineralization (0.25 g/t Au to 0.4 g/t Au). Several distinct anomalous mineralized domains are recognized, separated by barren intercalated mafic and felsic rocks.

Disseminated sulfide mineralization is hosted mainly within the Felsic tuff unit and is predominantly or entirely pre-orogenic. Disseminated pyrite crystals are coarse and also locally stretched. Some mafic units carry similar mineralization but with a notably lower sulfide vein density.

The Montagne d'Or deposit is now thought to be part of a stratiform/stratabound deposit type. Mineralization consists of pyrite, pyrrhotite and chalcopyrite with minor sphalerite, magnetite and arsenopyrite. Arsenopyrite, although observed, does not appear to have an obvious relationship with either gold or copper mineralization. Distinct phases are reported as stratiform disseminated sulfides, stockwork sulfide veinlets and layers of semi-massive sulfides that are tectonically transposed. The latter facies is considered as syn-volcanic in origin and as the most favorable occurrence for gold mineralization.

The disseminated sulfide veins could be related to feeder zones and/or remobilized on fold hinges and shear zones. In addition, evidence is found for tectonic remobilization with sulfides concentrated within fold hinges and pressure shadows, and cross-cutting sulfide-bearing veins.

Visible gold occurs in chlorite-rich zones or is spatially related to sulfide mineralization (after Giraud, Tremblay, Jébrak and Lefrançois, 2014). Figure 7.3.1.1 shows a photograph of native gold hosted by mafic volcanic rocks in drillhole MO1266 at a depth of 245 m. This particular one meter interval ran 80.75 g/t Au. There is generally an increase in gold grades as sulfide (excluding pyrrhotite) content increases. Microscopic studies indicate that gold occurs as very fine grains in the host rock groundmass and at the junctions of quartz crystals. Gold has only very rarely been seen as inclusions within sulfide minerals.


Source: Columbus, 2013

**Figure 7.3.1: Example of Visible Gold Occurring within Mafic Volcanics (MO1266)**

# 8 Deposit Type

The current interpretation is that Montagne d'Or is a deformed volcanogenic massive sulfide deposit (Ross 2014). Ross based this interpretation largely on the following details of the deposit.

- The presence of pillow basalts in the Upper Mafic Unit, making at least this part of the volcanic succession submarine, and formed on the ocean floor;
- The Felsic Unit is cut by tholeiitic mafic dikes related to the Upper Mafic Unit, whereas the Upper Mafic Unit is cut by calc-alkaline QFP dikes related to the Felsic Unit;
- This means that the Felsic Unit and the Upper Mafic Unit are broadly contemporaneous; by association, the Felsic Unit is therefore also submarine;
- The Felsic Unit is indeed, partly, a layered volcaniclastic pile (Franklin et al., 2001). There are some QFP intrusions in this pile (as noted by Shaw, 2001), but at least some of the felsic rocks were deposited on the sea floor (Franklin, 1999); volcaniclastic rocks are ideal for sub-seafloor replacement;
- Alteration mineralogy is dominated by sericite and chlorite, which are typical VMS minerals, or their metamorphosed equivalents (e.g., garnet, biotite); and
- The sulfides were emplaced before tectonic deformation.

A submarine volcanic arc is presently thought to be the likeliest setting for the formation of the Montagne d'Or deposit; the Izu-Bonin arc south of Japan may be a plausible analogue (there are seafloor massive sulfides deposits currently forming in this arc; e.g., Glasby et al., 2000). A back-arc with a strong subduction signature is also possible, as back-arc basins can have voluminous felsic magmatism too, for example the Manus Basin offshore Papua New Guinea, where there are also seafloor massive sulfides actively accumulating (e.g., Binns and Scott, 1993; Paulick et al., 2004; Ross, 2014).

# 9 Exploration

Since completing the previous technical report effective to the end of June 2014, Columbus has only conducted exploration drilling. The latest drilling program was completed in November 2014.

# 10 Drilling

***Sections 10.1 and 10.2 have been excerpted from the Coffey 2014 Technical Report. Section 10.3 is updated current to this report. Standardizations have been made to suite the format of this report.***

Since the inception of exploration by Columbus, a total of 171 drillholes (MO1361 to MO14231) have been completed testing the Montagne d'Or deposit.

Earlier drilling completed by Guyanor consists of a total of 56 drillholes (MO9601 to MO9856) totaling 10,916 m on from 1996 to 1998. Assays from these drillholes are of lower quality (a characteristic that has been taken into account during resource classification) but are considered as relevant and fit-for- purpose for the resource estimate. (note: all holes drilled by Columbus are within the deposit; however, there are three Guyanor holes, hole numbers MO57, MO58, and MO59, which were drilled in 2001 on the Apollon target located to the southeast of the deposit, and drillhole MO60, the only hole drilled in 2007, which is not included in the database as it is a twin of a previous hole).

## 10.1 Guyanor Drilling Program: 1996 to 1998

From 1996 to 1998, Guyanor completed a total of 56 drillholes (MO9601 to MO9856) totaling 10,916 m on the Montagne d'Or prospect. Drilling was done under contract by Major Drilling Company of Canada. Drill pads and access were prepared using bulldozers and/or excavators; every attempt was made to limit deforestation and for this reason, use of an excavator was preferred for construction of drill pads.

Drilling procedures were to collar each hole with HQ bits (core diameter 6.35 cm) and reduce to NQ (core diameter 4.76 cm) when hard and not oxidized rock was intersected. Core recovery was routinely measured and recorded for each core run. Core recoveries overall were generally excellent. Major Drilling used Longyear 38 wireline diamond drilling rigs. Drillhole spacing is variable, from 50 to 250 m. Drill fences are spaced 100 to 200 m apart. The presence of clearly visible, regionally consistent, and well-defined $S_1$ fabric allowed the core to be manually oriented in the core boxes, although local variations have, on occasion, caused incorrect orientation. Saprolite was not oriented due to the absence of a clearly defined fabric. Core was placed in plastic core boxes at the drill site, with core markers placed at the start and end of each core run, and boxes securely covered. Core boxes were transported back to camp for detailed logging and core splitting. Core photography was carried out infrequently. All drillhole collars were a surveyed for X, Y, Z coordinates tied to the mine grid shortly after completion so as to provide an accurate location for resource estimation. The mine grid was tied to the X, Y UTM grid and the Z coordinates were shifted 1,000 m above mean sea level so that no negative elevations were present within the drillholes. Drillhole location surveys were performed by Guyanor survey crews and external surveyors from SATTAS using TDS equipment.

The first 47 drillholes were surveyed downhole for deviation and deflection by Major Drilling, mainly using acid bottle etch or Pajari /Tropari mechanical instruments. Downhole survey intervals were at 50 m. The final eight drillholes were surveyed in with Sperry Sun equipment. The downhole surveys using acid bottle etch and Tropari equipment were criticized within internal Guyanor documents as poorly suited to the task as only dip and no azimuth is recorded. The inaccuracy of the early downhole surveys is considered in mineral resource classification although it should be noted that due to the relatively short length, significant drillhole deviation and deflection at Montagne d'Or are minimal, with deflection of 5° to 10° over 200 m typical. Four drillholes were not collar surveyed; however, the planned hole coordinates have been used. Details for the drilling completed by Guyanor from 1996 to 1998 (56 holes in total) are listed in Table 10.1.1.

**Table 10.1.1: Drillholes (56 in Total) Drilled by Guyanor from 1996 to 1998**

| Drillhole | Easting | Northing | Elevation | Azimuth | Dip | Depth (m) | Operator | Year |
|---|---|---|---|---|---|---|---|---|
| MO9601 | 173091.8 | 520520.8 | 260.89 | 0 | -60 | 199.8 | Guyanor | 1996 |
| MO9602 | 173096.5 | 520499.6 | 268.60 | 0 | -60 | 52.5 | Guyanor | 1996 |
| MO9603 | 173051.7 | 520634.9 | 220.88 | 0 | -57 | 271.6 | Guyanor | 1996 |
| MO9604 | 173311.3 | 520611.1 | 269.68 | 0 | -61 | 208.6 | Guyanor | 1996 |
| MO9605 | 173298.7 | 520711.7 | 229.45 | 0 | -61 | 201.3 | Guyanor | 1996 |
| MO9606 | 173706.1 | 520583.6 | 273.74 | 0 | -60 | 199.6 | Guyanor | 1996 |
| MO9607 | 173717.2 | 520708.8 | 258.57 | 0 | -60 | 202.6 | Guyanor | 1996 |
| MO9608 | 173703.7 | 520765.8 | 227.79 | 0 | -60 | 199.6 | Guyanor | 1996 |
| MO9609 | 173703.5 | 520873.9 | 180.19 | 0 | -60 | 199.6 | Guyanor | 1996 |
| MO9610 | 173331.9 | 520908.4 | 173.50 | 0 | -60 | 199.6 | Guyanor | 1996 |
| MO9611 | 173302.2 | 520802.4 | 191.95 | 0 | -63 | 201.6 | Guyanor | 1996 |
| MO9612 | 173014.3 | 520820.4 | 163.98 | 0 | -61 | 201.55 | Guyanor | 1996 |
| MO9613 | 172973.3 | 520738.8 | 182.53 | 0 | -60 | 59.7 | Guyanor | 1996 |
| MO9614 | 172969.8 | 520742.4 | 182.30 | 358 | -61 | 205.6 | Guyanor | 1996 |
| MO9615 | 172763.0 | 520800.2 | 186.52 | 0 | -59 | 193.6 | Guyanor | 1996 |
| MO9616 | 172730.8 | 520700.8 | 189.25 | 0 | -60 | 199.6 | Guyanor | 1996 |
| MO9617 | 173335.5 | 521128.7 | 120.17 | 0 | -60 | 151.6 | Guyanor | 1996 |
| MO9618 | 173312.4 | 521000.7 | 151.73 | 0 | -60 | 156.6 | Guyanor | 1996 |
| MO9719 | 174129.7 | 520732.4 | 296.82 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9720 | 174136.4 | 520822.6 | 247.89 | 0 | -60 | 200 | Guyanor | 1997 |
| MO9721 | 173540.1 | 520678.7 | 273.57 | 0 | -60 | 200 | Guyanor | 1997 |
| MO9722 | 173534.4 | 520755.3 | 237.60 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9723 | 172233.0 | 520519.2 | 233.78 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9724 | 172236.9 | 520619.4 | 219.33 | 0 | -60 | 198.5 | Guyanor | 1997 |
| MO9725 | 172766.0 | 520594.6 | 228.71 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9726 | 174626.3 | 520774.4 | 204.39 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9727 | 174619.1 | 520860.7 | 184.97 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9728 | 174225.2 | 520750.7 | 300.96 | 0 | -60 | 199.5 | Guyanor | 1997 |
| MO9729 | 172337.5 | 520852.9 | 172.76 | 0 | -60 | 202.6 | Guyanor | 1997 |
| MO9730 | 172441.8 | 520929.5 | 141.84 | 0 | -60 | 199.6 | Guyanor | 1997 |
| MO9731 | 172897.2 | 520696.3 | 208.28 | 0 | -60 | 199.6 | Guyanor | 1997 |
| MO9732 | 172819.0 | 520493.9 | 251.18 | 0 | -60 | 277.6 | Guyanor | 1997 |
| MO9733 | 172601.1 | 520591.9 | 231.09 | 0 | -60 | 199.6 | Guyanor | 1997 |
| MO9734 | 173522.6 | 520581.7 | 321.30 | 0 | -60 | 22.7 | Guyanor | 1997 |
| MO9735 | 173528.4 | 520578.9 | 321.39 | 1 | -61 | 295.6 | Guyanor | 1997 |
| MO9736 | 173919.9 | 520736.5 | 285.07 | 0 | -60 | 199.6 | Guyanor | 1997 |
| MO9737 | 174222.9 | 520641.5 | 298.81 | 0 | -60 | 271.6 | Guyanor | 1997 |
| MO9738 | 174430.2 | 520753.1 | 262.39 | 0 | -60 | 263.9 | Guyanor | 1997 |
| MO9739 | 174627.0 | 520672.8 | 218.79 | 0 | -60 | 249.6 | Guyanor | 1997 |
| MO9740 | 172969.6 | 520672.7 | 227.21 | 0 | -59.5 | 229.6 | Guyanor | 1997 |
| MO9741 | 173051.5 | 520732.8 | 177.60 | 0 | -60 | 196.6 | Guyanor | 1997 |
| MO9742 | 173013.2 | 520736 | 179.61 | 358 | -60 | 190.6 | Guyanor | 1997 |
| MO9743 | 174806.0 | 520885 | 203.38 | 0 | -60 | 187.6 | Guyanor | 1997 |
| MO9744 | 174808.3 | 520780.7 | 209.90 | 0 | -60 | 199.6 | Guyanor | 1997 |
| MO9745 | 175107.2 | 520887.9 | 193.47 | 0 | -60 | 193.6 | Guyanor | 1997 |
| MO9746 | 175107.0 | 520788.2 | 203.67 | 0 | -60 | 238.4 | Guyanor | 1997 |
| MO9747 | 175479.7 | 520760.9 | 184.40 | 90 | -60 | 120.06 | Guyanor | 1997 |
| MO9748 | 175479.7 | 520760.9 | 184.40 | 0 | -60 | 193.6 | Guyanor | 1997 |
| MO9849 | 172826.3 | 520709.3 | 205.80 | 0 | -60 | 178.6 | Guyanor | 1998 |
| MO9850 | 174331.3 | 520751.2 | 296.62 | 0 | -60 | 150.9 | Guyanor | 1998 |
| MO9851 | 174025.5 | 520755.9 | 277.46 | 0 | -60 | 199.6 | Guyanor | 1998 |
| MO9852 | 173923.2 | 520780.7 | 266.02 | 0 | -60 | 151.6 | Guyanor | 1998 |
| MO9853 | 173834.6 | 520751.4 | 257.74 | 0 | -60 | 190.6 | Guyanor | 1998 |
| MO9854 | 172895.1 | 520592.8 | 260.41 | 0 | -60 | 199.6 | Guyanor | 1998 |
| MO9855 | 173975.4 | 520754.1 | 277.44 | 0 | -60 | 202.6 | Guyanor | 1998 |
| MO9856 | 174075.4 | 520762.1 | 270.31 | 0 | -60 | 211.6 | Guyanor | 1998 |

Source: Coffey, 2014
Coordinate System: CSG 167 datum UTM Zone 22

## 10.2 Columbus Drilling Program: 2011 to 2012

From the end of 2011 until August 2012, Columbus drilled 45 drillholes (MO11061 to MO12105) totaling 15721.45 m, named as Phase I of Columbus drilling. Drilling was done under contract by Performax Drilling of Val d'Or, Quebec, Canada.

Drilling procedures were very similar to those in the previous dill programs. All drillholes were collared using HQ equipment, downsizing to NQ after intersecting solid generally un-oxidized rock. Core recovery at the drill site averages 87.5% in HQ core (saprolite zone) increasing to 99.6% in NQ core (fresh material). Performax used a containerized Longyear 38 drill.

The drill program was designed to provide infill drillholes in known mineralized areas and to continue exploring strike extensions of the mineralization. Drillhole spacing in the central part of the mineralized zone varies between about 35 and 75 m and 100 to 200 m on the extremities.

The drillholes are, in general, inclined moderately to the north whereas the mineralization dips at 68° to 72° to the south. Therefore, the drillholes intercepts do not represent true thickness but true thickness averages approximately 75% of the intercept distance. Down-hole surveying of the drillholes was performed by the drill crew using a Reflex instrument. In some cases the Reflex instrument did not function correctly. For these holes an average was taken of measurements from 10 holes and these values were used where data could not be measured. Given that the deviation in all of the drillholes is very consistent this method is considered acceptable with minimal risk to the resource estimate.

A private contractor was hired to undertake surveying of all collars for holes MO1161 to MO11105 using CGS1967 datum. All drillhole collars were surveyed using GPS Total Station equipment. All previous drillhole coordinates were converted to CGS 1967 format, the 1,000 m elevation addition removed that was present in the earlier data and four older drill collars checked by re-surveying.

Details for the drilling completed by Columbus from 2011 to 2012 (45 in total) are provided in Table 10.2.1.

**Table 10.2.1: Drillholes (45 in total) completed by Columbus (Phase 1) in 2011 and 2012**

| Drillhole | Easting | Northing | Elevation | Azimuth | Dip | Depth (m) | Operator | Year |
|---|---|---|---|---|---|---|---|---|
| MO11061 | 173870.5 | 520648.2 | 299.21 | 0 | -70 | 350 | Columbus | 2011 |
| MO11062 | 173984.3 | 520647.0 | 318.16 | 0 | -70 | 399.3 | Columbus | 2011 |
| MO11063 | 174072.9 | 520652.0 | 323.75 | 2 | -60 | 378.5 | Columbus | 2011 |
| MO11064 | 172972.3 | 520539.8 | 287.46 | 2 | -60 | 419 | Columbus | 2011 |
| MO11065 | 172891.8 | 520514.1 | 272.39 | 0 | -60 | 356 | Columbus | 2011 |
| MO12066 | 173770.8 | 520701.9 | 260.19 | 0 | -60 | 329 | Columbus | 2012 |
| MO12067 | 173637.9 | 520647.7 | 267.48 | 0 | -60 | 361 | Columbus | 2012 |
| MO12068 | 173441.4 | 520625.4 | 302.83 | 0 | -60 | 380 | Columbus | 2012 |
| MO12069 | 172745.1 | 520503.5 | 256.82 | 0 | -60 | 257 | Columbus | 2012 |
| MO12070 | 173025.8 | 520633.6 | 231.30 | 0 | -60 | 302 | Columbus | 2012 |
| MO12071 | 173206.0 | 520874.6 | 177.80 | 180 | -50 | 308 | Columbus | 2012 |
| MO12072 | 173057.3 | 520786.8 | 182.46 | 180 | -50 | 350 | Columbus | 2012 |
| MO12073 | 172615.6 | 520814.2 | 197.01 | 180 | -50 | 440 | Columbus | 2012 |
| MO12074 | 174676.1 | 520781.4 | 214.08 | 0 | -60 | 275 | Columbus | 2012 |
| MO12075 | 174516.8 | 520766.1 | 220.82 | 0 | -60 | 251 | Columbus | 2012 |
| MO12076 | 174435.1 | 520938.4 | 197.49 | 180 | -50 | 322 | Columbus | 2012 |
| MO12077 | 174641.4 | 520982.6 | 175.94 | 180 | -50 | 429 | Columbus | 2012 |
| MO12078 | 173868.8 | 520909.9 | 204.46 | 180 | -50 | 411 | Columbus | 2012 |
| MO12079 | 173647.8 | 520914.1 | 180.94 | 180 | -50 | 375 | Columbus | 2012 |
| MO12080 | 173438.0 | 520852.2 | 203.50 | 180 | -50 | 387 | Columbus | 2012 |
| MO12081 | 174275.9 | 520736.9 | 306.87 | 0 | -60 | 345 | Columbus | 2012 |
| MO12082 | 174168.4 | 520723.3 | 307.91 | 0 | -60 | 351 | Columbus | 2012 |
| MO12083 | 174377.1 | 520732.0 | 282.60 | 0 | -60 | 317 | Columbus | 2012 |
| MO12084 | 174383.6 | 520739.2 | 282.61 | 180 | -50 | 152 | Columbus | 2012 |
| MO12085 | 174131.7 | 520647.2 | 332.27 | 0 | -60 | 425 | Columbus | 2012 |
| MO12086 | 174177.0 | 520640.8 | 324.31 | 0 | -60 | 425 | Columbus | 2012 |
| MO12087 | 173436.6 | 520764.9 | 239.73 | 0 | -60 | 302 | Columbus | 2012 |
| MO12088 | 173485.4 | 520764.4 | 247.61 | 0 | -60 | 299 | Columbus | 2012 |
| MO12089 | 173586.3 | 520732.8 | 244.44 | 0 | -60 | 299 | Columbus | 2012 |
| MO12090 | 173303.8 | 520552.2 | 287.75 | 0 | -60 | 409 | Columbus | 2012 |
| MO12091 | 173220.9 | 520589.5 | 273.50 | 0 | -60 | 400 | Columbus | 2012 |
| MO12092 | 173022.7 | 520529.7 | 286.08 | 0 | -60 | 374 | Columbus | 2012 |
| MO12093 | 172924.8 | 520529.8 | 281.68 | 0 | -60 | 448 | Columbus | 2012 |
| MO12094 | 173101.5 | 520495.5 | 269.14 | 0 | -60 | 464 | Columbus | 2012 |
| MO12095 | 172845.4 | 520562.1 | 264.26 | 0 | -60 | 365 | Columbus | 2012 |
| MO12096 | 172604.5 | 520508.4 | 237.74 | 180 | -60 | 119 | Columbus | 2012 |
| MO12097 | 172603.7 | 520503.0 | 238.06 | 0 | -60 | 422 | Columbus | 2012 |
| MO12098 | 172636.2 | 520437.3 | 239.94 | 0 | -60 | 389 | Columbus | 2012 |
| MO12099 | 172423.6 | 520558.3 | 301.23 | 0 | -60 | 221 | Columbus | 2012 |
| MO12100 | 173169.6 | 520544.9 | 282.64 | 0 | -60 | 381 | Columbus | 2012 |
| MO12101 | 173261.1 | 520557.3 | 283.30 | 0 | -50 | 350 | Columbus | 2012 |
| MO12102 | 173363.8 | 520634.2 | 274.71 | 0 | -60 | 344 | Columbus | 2012 |
| MO12103 | 173394.2 | 520670.0 | 272.00 | 0 | -60 | 281 | Columbus | 2012 |
| MO12104 | 173490.1 | 520704.8 | 273.95 | 0 | -70 | 346.65 | Columbus | 2012 |
| MO12105 | 173587.3 | 520673.7 | 273.08 | 0 | -60 | 413 | Columbus | 2012 |

Source: Coffey, 2014
Coordinate System: CSG 167 datum UTM Zone 22

## 10.3 Columbus Drilling Program: 2013 to 2014

From early 2013 until November 2014, Columbus drilled a total of 126 drillholes (MO13106 to MO14231) (25,073.6 m) and 13 abandoned and re-drilled holes (495.0 m), for a total of 25,568.6 m. This corresponds to the Phase II of Columbus drilling. Drilling was done under contract by Performax Drilling of Val d'Or, Quebec, Canada. Drilling procedures were the same to those in the previous programs. All drillholes were collared using HQ equipment downsizing to NQ after intersecting solid generally un-oxidized rock. Core recovery at the drill site averages 87.5% for HQ drillholes in the saprolite zone and 99.6% in NQ drillholes in fresh material. Details of the most recent drillholes completed by Columbus in 2013 and 2014 are presented in Table 10.3.1.

**Table 10.3.1: Drillholes (126 in total) completed by Columbus (Phase 2) in 2013 and 2014**

| Drillhole # | UTM East | UTM North | Elevation (m) | Azimuth | Dip | Length (m) |
|---|---|---|---|---|---|---|
| MO14113 | 173220 | 520780 | 240 | 0 | -60 | 118 |
| MO14114 | 173170 | 520800 | 195 | 0 | -60 | 88.6 |
| MO14115 | 173170 | 520745 | 215 | 0 | -60 | 167 |
| MO14116 | 173350 | 520745 | 230 | 0 | -60 | 149 |
| MO14117 | 173260 | 520665 | 250 | 0 | -60 | 161 |
| MO14118 | 173100 | 520770 | 190 | 0 | -60 | 74 |
| MO14119 | 173100 | 520725 | 190 | 0 | -60 | 143 |
| MO14120 | 172930 | 520760 | 175 | 0 | -60 | 122 |
| MO14121 | 172890 | 520770 | 175 | 0 | -60 | 110.5 |
| MO14122 | 172810 | 520765 | 190 | 0 | -60 | 111.5 |
| MO14123 | 172750 | 520760 | 180 | 0 | -60 | 104 |
| MO14124 | 172700 | 520760 | 180 | 0 | -60 | 101 |
| MO14125 | 172650 | 520750 | 200 | 0 | -60 | 124 |
| MO14126 | 172600 | 520740 | 210 | 0 | -60 | 122 |
| MO14127 | 172500 | 520760 | 210 | 0 | -60 | 98 |
| MO14128 | 172650 | 520630 | 200 | 0 | -60 | 123 |
| MO14129 | 173775 | 520860 | 200 | 0 | -60 | 122 |
| MO14130 | 173875 | 520820 | 235 | 0 | -60 | 98 |
| MO14131 | 173825 | 520815 | 220 | 0 | -60 | 98 |
| MO14132 | 173925 | 520840 | 240 | 0 | -60 | 107 |
| MO14133 | 173975 | 520835 | 250 | 0 | -60 | 121.5 |
| MO14134 | 174025 | 520850 | 235 | 0 | -60 | 111 |
| MO14135 | 174075 | 520840 | 235 | 0 | -60 | 131 |
| MO14136 | 174175 | 520865 | 240 | 0 | -60 | 101 |
| MO14137 | 174225 | 520840 | 255 | 0 | -60 | 164 |
| MO14138 | 173590 | 520865 | 200 | 0 | -60 | 116 |
| MO14139 | 173540 | 520870 | 200 | 0 | -60 | 95 |
| MO14140 | 174575 | 520850 | 190 | 0 | -60 | 134 |
| MO14141 | 174675 | 520895 | 200 | 0 | -60 | 119 |
| MO14142 | 174675 | 520840 | 210 | 0 | -60 | 179 |
| MO14143 | 174525 | 520830 | 215 | 0 | -60 | 169 |
| MO14144 | 174475 | 520850 | 215 | 0 | -60 | 158 |
| MO14145 | 174375 | 520865 | 235 | 0 | -60 | 131 |
| MO14146 | 174425 | 520840 | 230 | 0 | -60 | 155 |
| MO14147 | 174525 | 520880 | 195 | 0 | -60 | 101 |
| MO14148 | 173010 | 520465 | 290 | 0 | -60 | 150.8 |
| MO14149 | 172850 | 520630 | 245 | 0 | -60 | 164 |
| MO14150 | 172810 | 520620 | 245 | 0 | -60 | 161 |
| MO14151 | 172400 | 520620 | 275 | 0 | -60 | 125 |
| MO14152 | 172500 | 520600 | 275 | 0 | -60 | 161 |
| MO14153 | 172707 | 520584 | 215 | 0 | -52 | 159.7 |
| MO14154 | 172650 | 520730 | 200 | 0 | -60 | 155 |
| MO14155 | 172600 | 520700 | 215 | 0 | -60 | 173 |
| MO14156 | 172400 | 520700 | 230 | 0 | -60 | 149 |
| MO14157 | 172500 | 520700 | 230 | 0 | -60 | 184 |
| MO14158A | 172700 | 520720 | 185 | 0 | -60 | 22.5 |

| Drillhole # | UTM East | UTM North | Elevation (m) | Azimuth | Dip | Length (m) |
|---|---|---|---|---|---|---|
| MO14158 | 172700 | 520720 | 185 | 0 | -60 | 153 |
| MO14159 | 172850 | 520750 | 190 | 0 | -60 | 130 |
| MO14160 | 173400 | 520795 | 220 | 0 | -60 | 166 |
| MO14161 | 173700 | 520835 | 195 | 0 | -60 | 158 |
| MO14162 | 174326 | 520829 | 254 | 0 | -60 | 198 |
| MO14163 | 174276 | 520839 | 247 | 0 | -60 | 171 |
| MO14164 | 172399 | 520510 | 304 | 0 | -60 | 266 |
| MO14165 | 172499 | 520540 | 292 | 0 | -60 | 221 |
| MO14166 | 172809 | 520570 | 249 | 0 | -60 | 226.6 |
| MO14167 | 172969 | 520620 | 253 | 0 | -60 | 191 |
| MO14168 | 172930 | 520605 | 270 | 0 | -60 | 242 |
| MO14169 | 172849 | 520515 | 263 | 0 | -60 | 287.6 |
| MO14170 | 172930 | 520670 | 225 | 0 | -60 | 281 |
| MO14171 | 173051 | 520568 | 256 | 0 | -60 | 257 |
| MO14172 | 173099 | 520595 | 244 | 0 | -60 | 200 |
| MO14173 | 173099 | 520665 | 215 | 0 | -60 | 260 |
| MO14174 | 174025 | 520695 | 303 | 0 | -62 | 316.9 |
| MO14175 | 173875 | 520695 | 290 | 0 | -62 | 278 |
| MO14176 | 174025 | 520620 | 330 | 0 | -62 | 365 |
| MO14177 | 173925 | 520680 | 302 | 0 | -62 | 317 |
| MO14178 | 173975 | 520680 | 307 | 0 | -62 | 323 |
| MO14179 | 173925 | 520620 | 318 | 0 | -62 | 329 |
| MO14180A | 172969 | 520500 | 292 | 0 | -62 | 125 |
| MO14180 | 172969 | 520500 | 292 | 0 | -62 | 344 |
| MO14181 | 173825 | 520620 | 299 | 0 | -62 | 307 |
| MO14182 | 173775 | 520575 | 308 | 0 | -62 | 344 |
| MO14183A | 173775 | 520640 | 283 | 0 | -62 | 98 |
| MO14183B | 173775 | 520640 | 283 | 0 | -62 | 15.5 |
| MO14183 | 173775 | 520640 | 283 | 0 | -62 | 266 |
| MO14184 | 173700 | 520660 | 259 | 0 | -62 | 293 |
| MO14185 | 173825 | 520690 | 273 | 0 | -62 | 349 |
| MO14186 | 172699 | 520540 | 230 | 2 | -62 | 230 |
| MO14187 | 172650 | 520600 | 205 | 0 | -60 | 299 |
| MO14188 | 172550 | 520760 | 210 | 0 | -60 | 104 |
| MO14189 | 172400 | 520735 | 219 | 0 | -60 | 145 |
| MO14190 | 173875 | 520765 | 260 | 0 | -62 | 177 |
| MO14191A | 172499 | 520490 | 286 | 0 | -62 | 62 |
| MO14191 | 172499 | 520490 | 286 | 2 | -62 | 301 |
| MO14192 | 172650 | 520535 | 220 | 2 | -62 | 230 |
| MO14193 | 172550 | 520610 | 250 | 0 | -60 | 308 |
| MO14194 | 172550 | 520550 | 265 | 0 | -60 | 239 |
| MO14195 | 172929 | 520490 | 273 | 0 | -64 | 322.8 |
| MO14196 | 172889 | 520465 | 261 | 0 | -62 | 108 |
| MO14197 | 172849 | 520455 | 259 | 0 | -62 | 123 |
| MO14198 | 173650 | 520590 | 276 | 1 | -64 | 320 |
| MO14199A | 173440 | 520675 | 289 | 2 | -65 | 30.5 |
| MO14199B | 173440 | 520675 | 289 | 2 | -65 | 36.5 |
| MO14199 | 173440 | 520675 | 289 | 2 | -65 | 320 |
| MO14200 | 173169 | 520680 | 225 | 1 | -63 | 239 |
| MO14201 | 173590 | 520600 | 301 | 2 | -65 | 353 |
| MO14206 | 172550 | 520700 | 225 | 0 | -62 | 191 |
| MO14207 | 173169 | 520490 | 287 | 0 | -62 | 188 |
| MO14208 | 173219 | 520545 | 293 | 0 | -64 | 353 |
| MO14209A | 173169 | 520605 | 264 | 0.5 | -62 | 15.5 |
| MO14209 | 173169 | 520605 | 264 | 0.5 | -62 | 247 |
| MO14210 | 173220 | 520700 | 235 | 0 | -62 | 197 |

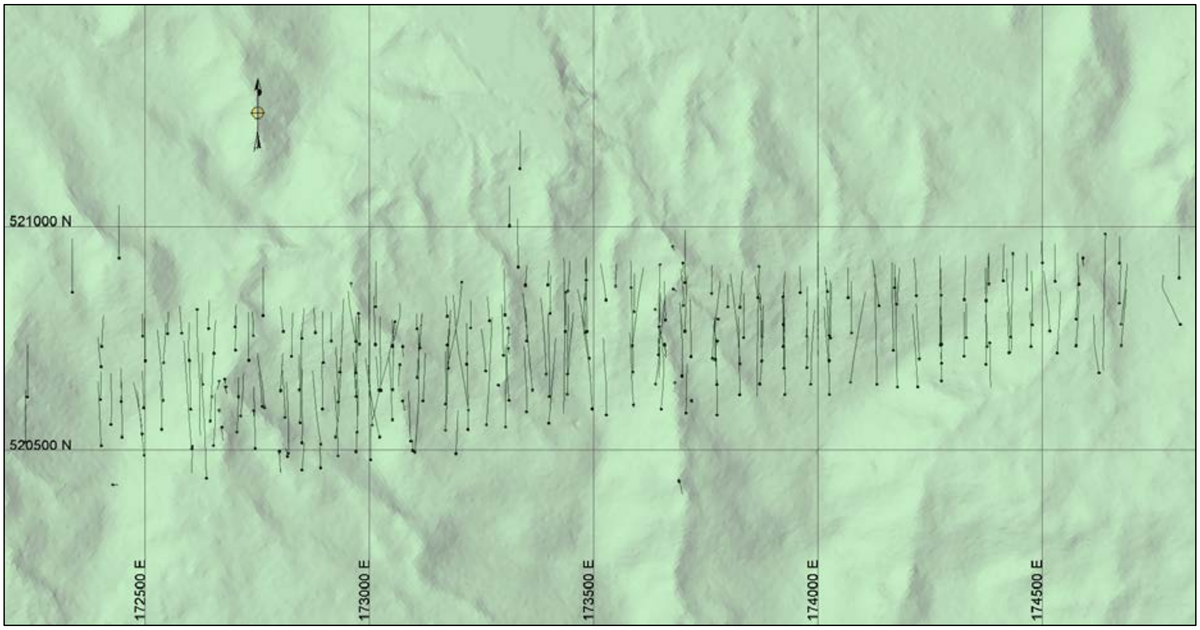
| Drillhole # | UTM East | UTM North | Elevation (m) | Azimuth | Dip | Length (m) |
|---|---|---|---|---|---|---|
| MO14211 | 173650 | 520710 | 242 | 1 | -64 | 293 |
| MO14212 | 173590 | 520810 | 212 | 1 | -63 | 182 |
| MO14213 | 173650 | 520790 | 199 | 0 | -63 | 179 |
| MO14214 | 173825 | 520815 | 225 | 2 | -65 | 194 |
| MO14215A | 174225 | 520700 | 317 | 2 | -65 | 18.5 |
| MO14215 | 174225 | 520700 | 317 | 2 | -65 | 251 |
| MO14216 | 174576 | 520784 | 202 | 2 | -63 | 210 |
| MO14217 | 174576 | 520726 | 212 | 1 | -63 | 270 |
| MO14218A | 173010 | 520565 | 276 | 2 | -63 | 18.5 |
| MO14218 | 173010 | 520565 | 276 | 2 | -63 | 269 |
| MO14219 | 174476 | 520725 | 245 | 1 | -63 | 182 |
| MO14220 | 174276 | 520650 | 286 | 2 | -63 | 257 |
| MO14221 | 174275 | 520690 | 301 | 1 | -63 | 227 |
| MO14222 | 174175 | 520800 | 270 | 2 | -64 | 188 |
| MO14223 | 174375 | 520800 | 265 | 1 | -63 | 233 |
| MO14224 | 174476 | 520774 | 239 | 1 | -62 | 239 |
| MO14225A | 174326 | 520705 | 294 | 0 | -63 | 6.5 |
| MO14225 | 174326 | 520705 | 294 | 0 | -63 | 206 |
| MO14226 | 174526 | 520716 | 212 | 1 | -63 | 280 |
| MO14227A | 174376 | 520685 | 275 | 1 | -63 | 15.5 |
| MO14227 | 174376 | 520685 | 275 | 1 | -63 | 224 |
| MO14228A | 174426 | 520710 | 258 | 1 | -63 | 30.5 |
| MO14228 | 174426 | 520710 | 258 | 1 | -63 | 200 |
| MO14229 | 174675 | 520723 | 216 | 1 | -64 | 290 |
| MO14230 | 172450 | 520590 | 275 | 1 | -62 | 143 |
| MO14231 | 172450 | 520530 | 306 | 1 | -63 | 233 |
| **Total Meters** | | | | | | **25,568.6** |

Source: Columbus, 2015

## 10.4 Interpretation of Drillhole Results

The drilling types described above all constitute industry standard methods of exploration for this type of mineralization and material. The sampling procedures all meet industry best practices and an appropriate chain of custody has been utilized during all handling and sampling of the drill core or cuttings. The drillholes are inclined on average at -60° toward the -70° dipping mineralization; therefore, the drillhole intersections do not represent true thickness of the mineralization. The drillholes generally intersect the mineralization at approximately 50°, which SRK considers appropriate to define the geologic model and mineralization.

SRK is of the opinion that best professional judgment, and appropriate exploration and scientific methods were utilized in the collection and interpretation of the drilling data used in this report. The sampling is sufficient and spaced appropriately to support the resource estimation. Figure 10.4.1 presents an overview of the drillhole locations.




Source: SRK, 2015

**Figure 10.4.1: Plan View of Drillhole Traces**

# 11 Sample Preparation, Analysis and Security

The information presented in this section concerning pre-2011 sampling and analysis has been largely based on the SRK report, Stryhas, B (2012) with additional information as specified for updated drilling data provided by Columbus.

## 11.1 Historical Methods

Limited information is available on the historical transport, sampling and analysis of the Guyanor drillholes. The diamond drill core was transported from the drill site to the Boeuf Mort camp where all geologic logging and sampling was conducted. Sample intervals were marked in advance by the project geologists. The saprolite core was halved with a knife, while fresh rock core was sawn with a powered diamond saw. The original assay lengths range from 0.1 to 4.3 m with an average of 1.0 m. A total of 10,693 samples were taken. The presence of dispersed zones of very narrow sulfide bands, in some cases, forced sample intervals that did not always conform to the actual lithologic breaks. The sawn half-core was bagged, labelled on site, and sent out for assaying.

Sample bags were routinely placed in plastic rice bags and sealed to prevent tampering between the campsite and the laboratory. The remaining half core was returned to the core box and stored for future reference.

Rock quality description (RQD) measurements were completed on selected intervals in seven drillholes during the 1998 campaign. Magnetic susceptibility measurements were completed for 18 drillholes during this campaign (MO9601 to MO9618).

Bulk density measurements on drill core were not performed on a regular basis. The densities used for previous resource estimations utilized bulk densities taken from equivalent or nominal rock types (not described).

The diamond core and channel samples collected in the Montagne d'Or prospect area during the 1996/1998 drilling campaign were dispatched to six separate laboratories for sample size reduction, homogenization, and assay determination. Analytical methodologies utilized were typically fire assay with an atomic absorption finish. A few samples were assayed by fire assay with a gravimetric finish. These are appropriate and standard methodologies for gold analysis. There is no documentation in the project files related to the certification of any of the laboratories used to analyze the Montagne d'Or prospect samples. It was not industry standard of the time to undergo certification procedures.

The QA/QC procedures for the Montagne d'Or Prospect analytical work prior to 1998 utilized check assays performed on quarter core, the remaining half of re-sawn split half core. Most quarter-core samples were collected from barren core (<0.05 g/t Au) and used for blank material. Since the samples were not extracted from the same pulp, the samples are more correctly termed field duplicates. No data are available for assay standards included with any of the drill or channel sample analyses. Internal check assay information is provided for five of the six laboratories that were used for gold assaying.

RSG (2004) provided a review of the QA/QC results obtained during the history of the drilling and they concluded the following: the results of the RSG Global statistical assessment of the quality control data suggest that the SGS Cayenne and CanTech laboratories were producing assay results of an acceptable precision and unknown accuracy, but that the SGS France and Cone Colorado laboratories were not producing assays of an acceptable precision. The various coarse reject check assaying programs indicate that there are serious problem at all or some of the laboratories and that precision levels from all the check assay programs are unacceptable. Correlation between assay pairs is very poor with significant bias shown in some instances. The accuracy of the data produced by each laboratory cannot be assessed without standard reference assay data, and this is a material flaw in the check assay programs completed to that date.

In 2007, Golden Star conducted a modern QA/QC analysis during a re-assay program of the historical drill core at the Paul Isnard deposit. This consisted of re-sampling of the core from a wide distribution of drillholes, insertion of blanks and standards, and submitting all these to an accredited laboratory.

The laboratory employed industry standard sample preparation and the techniques of analyses were appropriate for the level of gold mineralization. The results of the QA/QC verified the credibility of the 2007 re-assay results. This is discussed further in Section 11.3.

## 11.2 Columbus Drill Program

The following description of sample preparation and core handling protocols applies to all drilling carried out by Columbus to date on the Montagne d'Or prospect. The next sections describe the 2011 and 2012 logging and sampling procedures, which were upgraded for the 2013 and 2014 program (geotechnical logging, core photography, air transport to Cayenne, use of Geotic software, assays on 50 g split by FA AA, assays above 5 g/t Au re-assayed by gravimetrics, refer also Section 12). Program details on the current logging, sampling and QA/QC protocols were discussed in detail with Columbus staff during the site visits by SRK and their systematic application with respect to the project was confirmed.

### 11.2.1 Core Logging and Sampling

Drill core is placed in plastic trays at the drill site by the drill crew. Drillers either transport the core to the end of the road for pickup by Columbus personnel or directly to the core shack in the Citron Camp.

Once in the camp the core boxes are opened and placed in order on logging racks within the core logging facility (Figure 11.2.1.1). If space is not available then the core is stored in core racks adjacent to the logging facility.

Source: Columbus, 2015

**Figure 11.2.1.1: Core Logging Facility at the Citron Exploration Camp**

The drill core is washed to remove any dirt or grease and reconstituted. The core is measured to ensure that there are markers every meter. Basic geotechnical logging is initially undertaken, measuring recovery and RQD.

The core is descriptively logged and marked for sampling by Columbus geologists. Logging and sampling information is entered into a computer using Excel software. Selected intervals of core are photographed however the entire drillhole is not systematically photographed.

After logging the core is prepared for sampling. A line is drawn down the core and the cutter uses this as a guide. The entire drillhole is then cut. A Columbus geologist does the actual sampling.

The core is sampled at one meter intervals using the measuring blocks prepared upon initial receipt of the drill core as a guide. The entire drillhole is sampled at an average of 1 m intervals; sample lengths are adjusted to honor lithological contacts and mineralized intervals. Half of the drill core is placed in a plastic sample bag while the other half is retained din the core box for future reference. Saprolite material is cut with a knife and half placed in a textile bag for assay and the other half returned to the core box The samples and sample bags are numbered sequentially in advance allowing for the insertion standard reference samples, duplicates and blanks. The plastic sample bags are placed in larger rice bags and sealed for shipping. The sample bags are then sent by air transport to Cayenne and dropped off by SOTRAPMAG personnel to the Filab depot in Cayenne, followed by road transport from Cayenne to the laboratory in Paramaribo, Suriname for preparation and analyses.

All the core from Columbus's drilling is stored in covered core racks at the Citron exploration camp (Figure 11.2.1.2).

Source: Columbus, 2015

**Figure 11.2.1.2: Core Racks at the Citron Exploration Camp**

## 11.2.2 Density Measurements

Columbus measures the bulk density of representative samples of the various rock types and not the bulk density in each drillhole. They used a conventional bulk density scale with a basket suspended below the scale to allow immersion in water. Samples are not coated in paraffin wax, however, the core was observed to be generally solid with very little pores. Saprolite was wrapped in cellophane.

The following measurement methodology was employed:

- Weigh the sample to determine the dry mass;
- Place the sample in a basket and weigh it, suspended from a balance, in (under) water. Subtract the weight of the basket in (under) water, to determine the mass of the sample in water; and
- The relative dry bulk density, a unit-less ratio, is calculated as the dry mass of the sample in air divided by the difference in the mass of the sample in air and the mass of the sample in water.

The scale is zeroed out before each use and the weight of the basket holding the core is repeatedly measured.

Water density is assumed to be 1.0 t/m$^3$ with no adjustment made for changes in water temperature. Since all measurements were performed indoor in normal air temperatures, the actual water density should range between 0.999 t/m$^3$ at 15° C to 0.997 t/m$^3$ at 25°C. Therefore, assuming a value of 1.0 t/m$^3$ for water density will not introduce a significant bias in the estimate and is to industry standards.

As of November 2014, Columbus had made a total of 3,323 bulk density measurements on Montagne d'Or drill core. Bulk Density measurements were recorded for 9 different rock units (Table 11.2.2.1).

**Table 11.2.2.1: Listing of Montagne d'Or Prospect Dry Rock Density Measurements**

| Rock Type | Number of Measurements | Average Density g/cm$^3$ |
|---|---:|---:|
| Saprolite | 354 | 1.695 |
| Saprolite-Rock Transition | 193 | 2.365 |
| Felsic Tuff | 1,056 | 2.911 |
| Mafic Volcanics | 413 | 3.154 |
| Granodiorite | 615 | 2.754 |
| Feldspar Porphyry | 61 | 2.786 |
| Quartz-Feldspar Porphyry | 164 | 2.817 |
| Lapilli Tuff | 75 | 2.864 |
| Diabase Dikes | 392 | 3.016 |

Source: SRK, 2015

### 11.2.3 Sample Preparation and Analysis

Columbus staff log and sample drill core but do not carry out any form of sample preparation (crushing/pulverizing) or analytical work on project samples. All project analytical work including sample preparation and analytical work is completed by FILAB at their laboratory in Paramaribo, Surinam.

FILAB established for several years a system of Quality Management and Safety to meet customer requirements (standards ISO17025 and ISO9001). FILAB is accredited by the DKD (now the DAkkS) and the SAFRAN Group and approved by DF control PMUC. The following description is sourced from documentation provided by FILAB.

After samples are received at the laboratory, then weighed and dried in furnaces at a temperature <130°C. They are then crushed and ground to a 70% <2.5 mm. From this grind a 300 to 400 g split is pulverized to 90% <100 µm. All equipment is cleaned by air after the processing of each sample.

Gold concentrations for the Columbus program are analyzed by FILAB using a 30 g sample split and fire assay pre-concentration methods followed by an atomic absorption spectroscopy finish (FA-AAS). The detection limit for this method is 0.01 ppm Au.

Gravimetric analysis was conducted on samples above a 5 g/t Au value for the 2013 and 2014 drilling program (the threshold is not reported for the earlier drilling and cannot be verified as personnel involved is no longer on site) and results from the gravimetric analysis were prioritized over FA in the database.

ICP analysis for up to 40 elements but routinely only for Ag and Cu are done using Aqua Regia digestion on a 0.25 g subsample.

FILAB routinely inserts blanks and certified reference materials (standards) into each batch of samples as an internal check.

## 11.3 Quality Assurance / Quality Control (QA/QC)

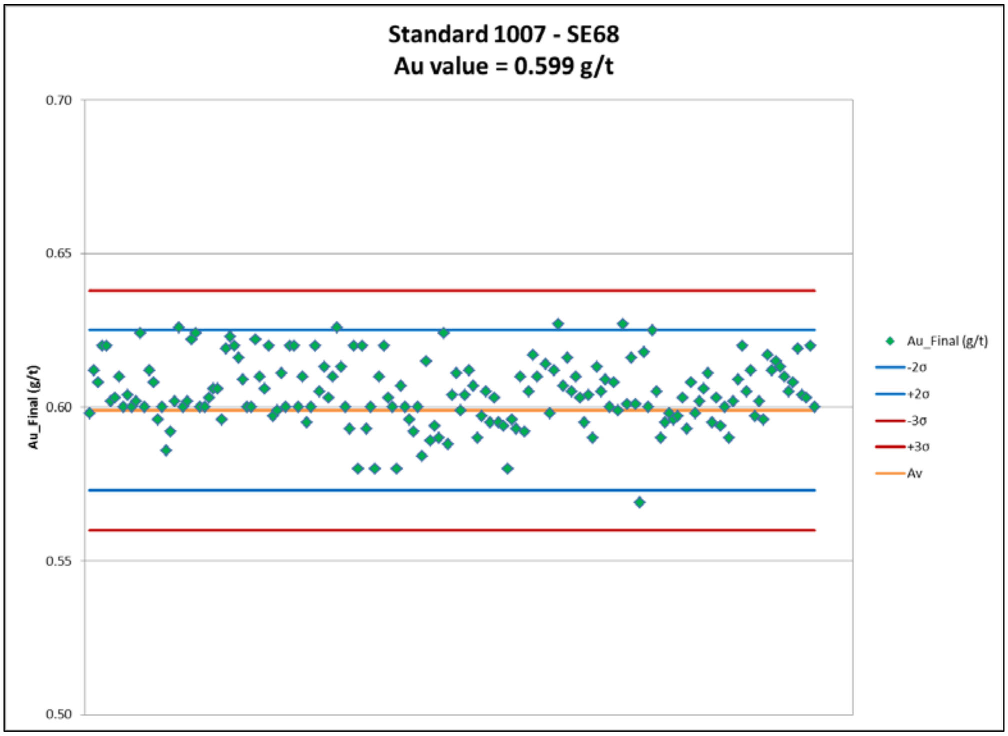
The QA/QC of all exploration data prior to June 29, 2014 has been presented in prior technical reports. The information presented below relates to the most recent exploration drilling conducted by Columbus during 2013 and 2014.

The Columbus QA/QC protocol of the 2013-2014 drilling programs included 14 different commercially certified standard reference materials for Au and blanks. The Columbus standards ranged between 0.599 to 8.981 g/t Au, which represents the typical levels of gold mineralization in the deposit. Standards are blindly inserted to the sample stream at a rate of 1:20 samples. The results of the standard analysis must be within ±2 standard deviations of the mean to pass the initial validation. In the case of standard result is between ±2 and ±3 standard deviations, a more complete check is made to determine if the result is valid or not. If the standard is outside a mineralized zone, reanalysis of the batch is not necessary. If two standards in succession, return results between ±2 and ±3 standard deviation, the batch is typically reanalyzed. If the standard value is outside ±3 standard deviations, the value is considered as erroneous and the entire batch is reanalyzed by the laboratory.

Columbus blanks are blindly inserted with at least one per batch with the blank located after an interpreted zone of mineralization. Blanks used during the program came from a granite quarry located near Cayenne. The blank analysis is considered valid if its value is lower than 5 times the limit of detection (0.005x5 = 0.025 ppm), confirming that no contamination occurred. If the analysis is beyond 5 times the limit of detection, the entire batch is reanalyzed by the laboratory.

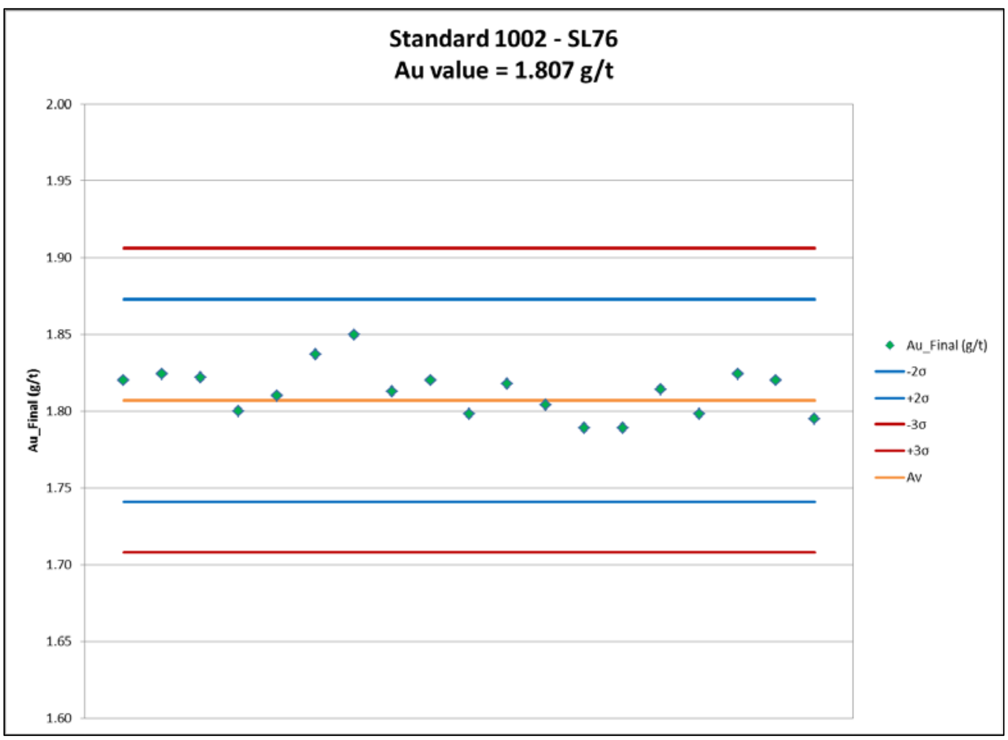
The laboratory conducts four types of internal QA/QC. They utilize two types of duplicates, standards and blanks. The laboratory uses duplicate pulps, generated and analyzed at a typical rate of 1:30 samples. Duplicate analyses of the same pulp are run at a typical rate of 1:15 samples.

QA/QC results are compiled in Excel as monthly reports. A representative set of standards at three typical grades and the blank results from the 2013-2014 drilling program are presented in Figures 11.3.1 to 11.3.4.



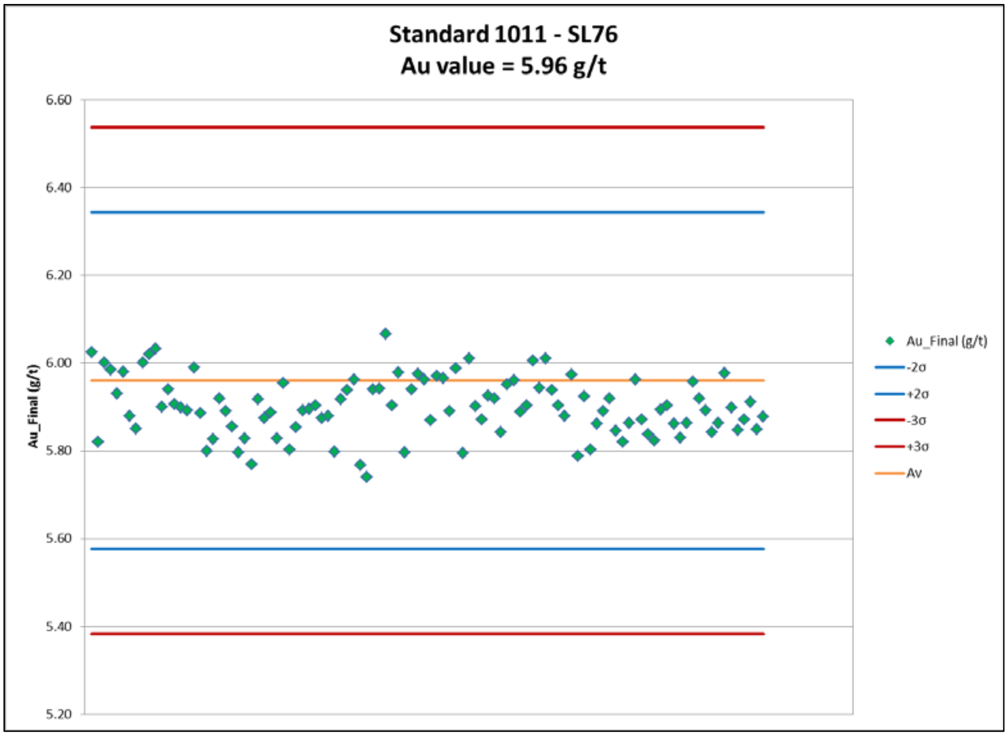

Source: Columbus, 2015

**Figure 11.3.1: Results of Au Standard at 0.599 g/t**



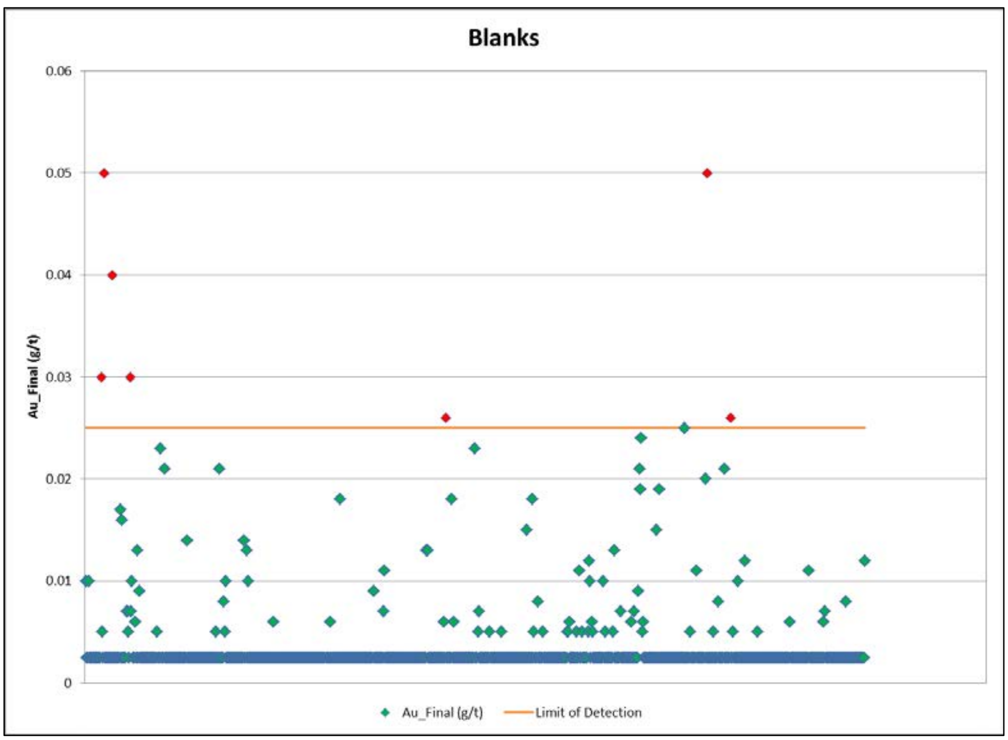

Source: Columbus, 2015

**Figure 11.3.2: Results of Au Standard at 1.807 g/t**




Source: Columbus, 2015

**Figure 11.3.3: Results of Au Standard at 5.96 g/t**




Source: Columbus, 2015

**Figure 11.3.4: Results of all Blank Analyses**

### 11.3.1 Conclusions

SRK is of the opinion that best professional judgment, and appropriate exploration and scientific methods were utilized in the preparation and analysis of the samples used in this report. SRK has reviewed the QA/QC results of the 2013-2014 drilling programs. SRK finds that the QA/QC program was well planned, executed and monitored. The standards are all certified and of appropriate levels of Au mineralization. The blank material is sufficiently hard so that it will scrub the sample preparation equipment to reveal any cross contamination. The results of the standards confirm there is no bias of the analytical lab. They also confirm that the laboratory has produced results with industry standard precision and accuracy. The blanks submitted with the QA/QC samples have shown that cross contamination or possible sample mix-ups are rare and do have a material impact on the analytical results.

# 12 Data Verification

## 12.1 Procedures

The database constructed prior to June 29, 2014 has been validated by previous QP's in order to support prior resource estimations. SRK validated the assay database by conducting systematic comparisons between the original assay certificate PDF copies to the electronic excel spreadsheet. Systematically spaced data was copied from a range of certificates that cover all of the new assays and was pasted directly into the Excel assay database for comparison. A total of 440 entries were checked, representing 2.5% of the new assay data. No discrepancies were found.

## 12.2 Limitations

SRK was not materially limited in its access to the supporting data used for the resource estimation. The database verification is limited to the procedures described above. All mineral resource data relies on the industry professionalism and integrity of those who collected and handled it. SRK is of the opinion that appropriate scientific methods and best professional judgment were utilized in the collection and interpretation of the data used in this report. However, users of this report are cautioned that the evaluation methods employed herein are subject to inherent uncertainties.

## 12.3 Opinion on Data Adequacy

It is SRK's opinion that the drillhole data is adequate to support the resource estimation of this report at the current level of resource classification. The database was constructed by Columbus under industry standard QA/QC protocols. Columbus maintains the database using GeoTic IOG an integrated database management system specifically designed to minimize the possibilities for data entry or data transfer errors. SRK's evaluation and subsequent validation of the database has provided good confidence in the data files.

# 13 Mineral Processing and Metallurgical Testing

Bureau Veritas Commodities Canada Ltd. - Inspectorate Metallurgical Division (Inspectorate) was retained by Nordgold to perform metallurgical testing on samples from the Project located in north-west French Guiana. The test program was directed and supervised by Eric Olin from SRK Consulting (U.S.) Inc. The results of this metallurgical investigation are fully documented in Inspectorate's report, "Metallurgical Testing to Recover Gold and Silver from the Montagne d'Or Gold Project, French Guiana", March 30, 2015.

The test program was focused on the testing of two master composites formulated from available whole core intervals representing the Upper Felsic Zone (UFZ) and the Lower Favorable Zone (LFZ), as well as selected variability composites.

Three process options, including whole-ore cyanidation, a combination of gravity concentration followed by cyanidation of gravity tailing, and gravity concentration followed by gold flotation from the gravity tailing and cyanidation of the flotation concentrate, were investigated on two master composites, and the preferred process option and optimal conditions were further verified on ten variability test composites.

## 13.1 Test Composite Representativeness

The metallurgical program was conducted on whole-core intervals derived from six metallurgical drillholes. The HQ size drillholes were planned based on the following criteria:

- Twinning of previous drillholes that intersected representative gold-copper intersections of variable grades across the principal felsic volcanic hosted UFZ and mixed volcanic hosted LFZ;
- A minimum of four intersections across UFZ and two across the LFZ, uniformly distributed along the east-west strike extent of the Montagne d'Or resources; and
- Intersections of the UFZ and LFZ in fresh rock below the weathered and oxidized saprolitic layer.

The drill core intervals selected for this metallurgical program are shown in Table 13.1.1 and the drillhole locations are shown in Figure 13.1.1.

**Table 13.1.1: Drillholes and Intervals Used for the Metallurgical Program**

| Hole ID | Zone | From (m) | To (m) | Length (m) | Core Wt. (kg) |
|---|---|---|---|---|---|
| MET-14-01 | UFZ | 108.0 | 145.0 | 37 | 315 |
| MET-14-02 | UFZ | 37.8 | 54.6 | 17 | 143 |
| | UFZ | 68.6 | 71.6 | 3 | 26 |
| | UFZ | 77.6 | 80.6 | 3 | 26 |
| | UFZ | 89.6 | 94.6 | 5 | 43 |
| | LFZ | 163.1 | 190.2 | 27 | 230 |
| **Total** | | | | **55** | **467** |
| MET-14-03 | UFZ | 37.0 | 163.0 | 126 | 1,071 |
| MET-14-04 | Sap | 2.0 | 51.8 | 50 | 423 |
| | UFZ | 51.8 | 78.8 | 27 | 230 |
| | LFZ | 125.0 | 150.6 | 26 | 218 |
| **Total** | | | | **102** | **870** |
| MET-14-05 | UFZ | 71.0 | 109.0 | 38 | 323 |
| | UFZ | 130.0 | 136.0 | 6 | 51 |
| **Total** | | | | **44** | **374** |
| MET-14-06 | LFZ | 79.6 | 103.5 | 24 | 203 |
| **Total Core** | | | | **388** | **3,300** |

Source: Inspectorate, 2015

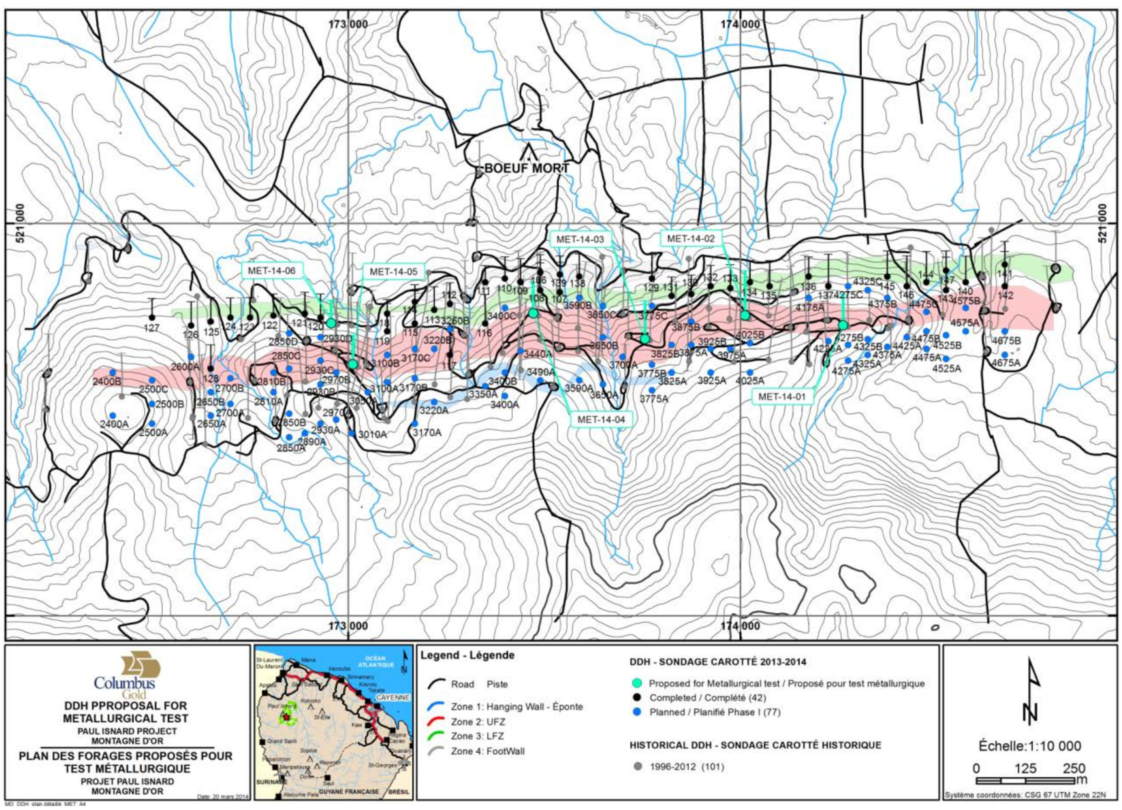



**Figure 13.1.1: Metallurgical Drillhole Locations**

The intervals used to formulate the UFZ master composite and six UFZ variability composites are identified in Table 13.1.2 and Table 13.1.3, respectively. Table 13.1.4 and Table 13.1.5 identify the intervals used to formulate the LFZ master composite and three LFZ variability composites. As shown in Table 13.1.6, the interval from 2 to 51.8 m in drillhole MET14-04 was used for formulating the saprolite variability composite. The variability composites were intended to represent spatial variability as well as variability with respect to gold and copper grade:

- UFZ – VC1: medium gold and low copper
- UFZ – VC2: low gold and low copper
- UFZ – VC3: medium gold and low copper
- UFZ – VC4: high gold and medium copper
- UFZ – VC5: medium gold and low copper
- UFZ – VC6: high gold and high copper
- LFZ – VC1: high gold and high copper
- LFZ – VC2: low gold and medium copper
- LFZ – VC3: medium gold and low copper

**Table 13.1.2: UFZ Master Compositing List**

| Hole ID | From (m) | To (m) | Length (m) | Weight (kg) |
|---|---|---|---|---|
| MET-14-01 | 108.0 | 145.0 | 37.0 | 79 |
| MET-14-02 | 37.8 | 54.6 | 16.8 | 36 |
| | 68.6 | 71.6 | 3.0 | 6 |
| | 77.6 | 80.6 | 3.0 | 6 |
| | 89.6 | 94.6 | 5.0 | 11 |
| MET-14-03 | 37.0 | 163.0 | 126.0 | 268 |
| MET-14-04 | 51.8 | 78.8 | 27.0 | 57 |
| MET-14-05 | 71.0 | 109.0 | 38.0 | 81 |
| | 130.0 | 136.0 | 6.0 | 13 |
| **Total** | | | | **556** |

Source: Inspectorate, 2015

**Table 13.1.3: UFZ Variability Compositing List**

| UFZ Variability Composite ID | Interval | | | | Weight (kg) |
|---|---|---|---|---|---|
| | Hole ID | From (m) | To (m) | Length (m) | |
| UFZ-VC1 (Medium Au and Low Cu) | MET-14-01 | 108.0 | 145.0 | 37.0 | 79 |
| UFZ-VC2 (Low Au and Low Cu) | MET-14-02 | 37.8 | 54.6 | 16.8 | 36 |
| | | 68.6 | 71.6 | 3.0 | 6 |
| UFZ-VC3 (High Gold and Medium Cu) | MET-14-02 | 77.6 | 80.6 | 3.0 | 6 |
| | | 89.6 | 94.6 | 5.0 | 11 |
| UFZ-VC4 (Low Gold and Low Cu) | MET-14-03 | 37.0 | 163.0 | 126.0 | 268 |
| UFZ-VC5 (Medium Gold and Low Cu) | MET-14-04 | 51.8 | 78.8 | 27.0 | 57 |
| UFZ-VC6 (High Gold and High Cu) | MET-14-05 | 71.0 | 109.0 | 38.0 | 81 |
| | | 130.0 | 136.0 | 6.0 | 13 |

Source: Inspectorate, 2015

**Table 13.1.4: LFZ Master Compositing List**

| Hole ID | From (m) | To (m) | Length (m) | Weight (kg) |
|---|---|---|---|---|
| MET-14-02 | 163.1 | 190.2 | 27.1 | 86 |
| MET-14-04 | 125.0 | 150.6 | 25.6 | 82 |
| MET-14-06 | 79.6 | 105.3 | 25.7 | 76 |
| **Total** | | | | **244** |

Source: Inspectorate, 2015

**Table 13.1.5: LFZ Variability Compositing List**

| LFZ Variability Composite ID | Interval | | | | Weight (kg) |
|---|---|---|---|---|---|
| | Hole ID | From (m) | To (m) | Length (m) | |
| LFZ-VC1 (High Au and High Cu) | Met-14-02 | 163.1 | 190.2 | 27.1 | 86 |
| LFZ-VC2 (Low Au and Medium Cu) | Met-14-04 | 125.0 | 150.6 | 25.6 | 82 |
| LFZ-VC3 (Medium Au and Low Cu) | Met-14-06 | 79.6 | 105.3 | 23.9 | 76 |

Source: Inspectorate, 2015

**Table 13.1.6: Saprolite Variability Compositing List**

| Hole ID | From (m) | To (m) | Length (m) | Weight (kg) |
|---|---|---|---|---|
| Met-14-04 | 2.0 | 51.8 | 49.8 | 106 |

Source: Inspectorate, 2015

# 13.2 Test Composite Characterization

## 13.2.1 Chemical Analyses

The gold and silver assays were conducted on each composite by fire assay in triplicate and by metallic screen procedures. The UFZ master composite averaged about 1.54 g/t Au and 3.1 g/t Ag. The LFZ master composite averaged 1.54 g/t Au and 5.0 g/t Ag. The variability composites ranged from 0.84 to 3.65 g/t Au and 1.6 to 9.0 g/t Ag. The gold and silver assays are presented in Table 13.2.1.1. Additionally, all master and variability composites were analyzed for cyanide soluble gold, sequential copper, mercury, sulfur and carbon speciation, as well as ICP metals. The main assays of interest are presented in Table 13.2.1.2. The average copper content in the test composites was 0.1% Cu, which was generally present as primary copper. The presence of acid and cyanide soluble copper was relatively low. The total sulfur content varied from 0.7% to 4.9% and was primarily present as sulfide sulfur. In general, the LFZ master composite contained higher sulfur than the UFZ master composite. The carbon contents were very low, indicating that preg-robbing will likely not occur during cyanidation. Mercury ranged from 0.04 to 0.35 ppm in the master composites and 0.01 to 1.91 ppm in the variability composites.

**Table 13.2.1.1: Gold and Silver Analyses on UFZ and LFZ Master and Variability Composites**

| Composite ID | By Direct FA in Triplicate | | | | | | By Metallic | | Average | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Au (g/t) | Ag (g/t) | Au (g/t) | Ag (g/t) | Au (g/t) | Ag (g/t) | Au (g/t) | Ag (g/t) | Au (g/t) | Ag (g/t) |
| UFZ Master Comp. | 0.84 | 3.0 | 2.24 | 4.0 | 1.41 | 3.0 | 1.66 | 2.5 | 1.54 | 3.1 |
| UFZ-VC1 | 1.52 | 2.0 | 1.27 | 2.0 | 1.32 | 1.0 | 4.17 | 1.8 | 2.07 | 1.7 |
| UFZ-VC2 | 0.76 | 2.0 | 1.45 | 2.0 | 0.54 | 1.0 | 0.62 | 1.3 | 0.84 | 1.6 |
| UFZ-VC3 | 1.34 | 2.0 | 1.25 | 2.0 | 2.59 | <1 | 4.25 | 1.1 | 2.36 | 1.7 |
| UFZ-VC4 | 1.21 | 3.0 | 0.84 | 2.0 | 1.86 | 3.0 | 0.96 | 1.0 | 1.22 | 2.3 |
| UFZ-VC5 | 0.76 | 2.0 | 1.09 | 2.0 | 0.87 | 2.0 | 1.00 | 2.0 | 0.93 | 2.0 |
| UFZ-VC6 | 2.21 | 5.0 | 4.31 | 7.0 | 2.37 | 6.0 | 2.57 | 5.0 | 2.87 | 5.8 |
| UFZ Zone Average | | | | | | | | | 1.69 | 2.6 |
| LFZ Master Comp. | 1.35 | 6.0 | 1.82 | 4.0 | 1.51 | 4.0 | 1.50 | 5.8 | 1.55 | 5.0 |
| LFZ-VC1 | 2.31 | 10.0 | 2.26 | 8.0 | 7.45 | 11.0 | 2.58 | 7.1 | 3.65 | 9.0 |
| LFZ-VC2 | 0.46 | 4.0 | 0.49 | 1.0 | 3.04 | 2.0 | 1.15 | 3.5 | 1.29 | 2.6 |
| LFZ-VC3 | 0.71 | 4.0 | 1.15 | 5.0 | 0.98 | 4.0 | 1.21 | 6.5 | 1.01 | 4.9 |
| LFZ Zone Average | | | | | | | | | 1.87 | 5.4 |
| Saprolite Var. Comp. | 1.62 | 2.0 | 0.52 | 1.0 | 0.66 | 1.0 | 1.05 | 1.3 | 0.96 | 1.3 |

Source: Inspectorate, 2015

**Table 13.2.1.2: Elemental Analyses on UFZ and LFZ Master and Variability Composites**

| Items | Units | UFZ Zone | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Master Comp. | UFZ-VC1 | UFZ-VC2 | UFZ-VC3 | UFZ-VC4 | UFZ-VC5 | UFZ-VC6 |
| Au | g/mt | 1.54 | 2.07 | 0.84 | 2.36 | 1.22 | 0.93 | 2.87 |
| Ag | ppm | 3 | 2 | 2 | 2 | 2 | 2 | 6 |
| Au (CN Soluble) | g/mt | 0.74 | 1.05 | 0.40 | 0.91 | 0.63 | 0.75 | 1.02 |
| Cu | % | 0.10 | 0.07 | 0.07 | 0.10 | 0.09 | 0.02 | 0.21 |
| Cu(A.S.) | % | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cu(CN) | % | <0.01 | <0.01 | 0.01 | <0.01 | 0.01 | 0.01 | 0.01 |
| Cu(Resid.) | % | 0.08 | 0.05 | 0.04 | 0.08 | 0.06 | 0.01 | 0.18 |
| S(ele) | % | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| S(-2) | % | 1.67 | 2.39 | 0.67 | 1.89 | 1.61 | 0.52 | 2.66 |
| S(tot) | % | 1.70 | 2.41 | 0.71 | 1.91 | 1.63 | 0.68 | 2.68 |
| S(SO4) | % | 0.03 | 0.02 | 0.04 | 0.02 | 0.02 | 0.16 | 0.02 |
| C(tot) | % | 0.04 | 0.10 | 0.02 | <0.02 | 0.04 | <0.02 | 0.04 |
| C(Org) | % | 0.04 | 0.06 | 0.02 | <0.02 | 0.04 | <0.02 | 0.04 |
| C Graphite | % | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| C(Inorg) | % | <0.02 | 0.04 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Hg | ppm | 0.35 | 0.03 | 0.06 | 0.08 | 0.09 | 0.07 | 1.91 |

| Items | Units | LFZ Zone | | | | Saprolite Var. |
|---|---|---|---|---|---|---|
| | | Master Comp. | LFZ-VC1 | LFZ-VC2 | LFZ-VC3 | |
| Au | g/mt | 1.55 | 3.65 | 1.29 | 1.01 | 0.96 |
| Ag | ppm | 5 | 9 | 3 | 5 | 1 |
| Au (CN Soluble) | g/mt | 0.81 | 1.15 | 0.33 | 0.59 | 0.90 |
| Cu | % | 0.13 | 0.29 | 0.02 | 0.06 | 0.04 |
| Cu(A.S.) | % | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Cu(CN) | % | 0.01 | 0.02 | <0.01 | <0.01 | <0.01 |
| Cu(Resid.) | % | 0.09 | 0.22 | 0.01 | 0.04 | 0.03 |
| S(ele) | % | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| S(-2) | % | 2.45 | 4.94 | 0.80 | 1.35 | <0.02 |
| S(tot) | % | 2.47 | 4.97 | 0.82 | 1.37 | 0.02 |
| S(SO4) | % | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 |
| C(tot) | % | 0.06 | 0.02 | 0.04 | 0.11 | 0.06 |
| C(Org) | % | 0.04 | 0.02 | 0.03 | 0.07 | 0.06 |
| C Graphite | % | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| C(Inorg) | % | 0.02 | <0.02 | <0.02 | 0.04 | <0.02 |
| Hg | ppm | 0.04 | 0.06 | 0.12 | 0.01 | 0.01 |

Source: Inspectorate, 2015

## 13.2.2 Mineralogical Analyses

Representative sub-samples of the UFZ and LFZ master composites were examined by Quantitative Evaluation of Minerals by Scanning Electron (QEMSCAN) to identify the types of minerals and bulk associations, and to provide quantitative information on mineral percentages, particle size, shape, degree of liberation and locking analysis, and carrier mineral inspections for gold and silver. The results of the mineralogical analyses are fully documented in Inspectorate's report, "Mineralogical Study on the Master Composites," January 2015.

Each composite was ground to a $P_{80}$ of 75 µm and then screened into six sized fractions, varying from 105 to 25 µm, for automated mineral analysis. Polished block sections were prepared from each fraction and then systematically scanned using QEMSCAN. Due to the relatively low grade of gold and silver in the test composites, pre-concentration using a Knelson concentrator was performed on ~6 kg of each master composite to produce rougher gravity concentrate for gold and silver deportment mineralogy studies using the QEMSCAN Trace Mineral Search (TMS). Key findings from the mineralogical study were:

- The main sulfide minerals in the two master composites were pyrite and pyrrhotite, which accounted for 3.1% to 3.8% of the total mass. Chalcopyrite was the principal copper bearing mineral, and carried 98% of the copper in the test samples. Only trace amounts of copper were contained in chalcocite/covellite, bornite, and tetrahedrite. Other sulfide minerals, including sphalerite, galena, arsenopyrite, bismuthnite, cobaltite, and FeNi(Co)-sulfarsenide, were all at trace levels.
- The sulfide minerals were contained in a silicon rich non-sulfide gangue host. Over 95% of the non-sulfide minerals occurred as different types of silicates: including quartz, feldspar group minerals, muscovite/illite/biotite, chlorite, amphibole/pyroxene and kaolinite. The iron oxides occurred mostly as magnetite, hematite and ilmenite.
- The majority of the gold grains in the test gravity concentrate were present as native gold or gold electrum sized < 20 µm (12 to 13 µm on average). However, the coarsely grained gold, sized >30 µm, carried about 90% of the gold contained in the gravity concentrates. In comparison to LFZ composite, UFZ composite contained relatively higher amounts of native gold. In addition, the gold-mercury bearing mineral, goldamalgam [(Au,Ag)Hg], was observed in the UFZ composite.
- The gold liberation data showed that less than a quarter of the gold in the test composite was liberated. The unliberated gold was mostly interlocked with pyrite and non-sulfide gangue. A relatively low amount of gold was associated with chalcopyrite and sphalerite.

Most of the silver (>90%) was contained in gold or gold minerals. The other silver minerals noticed including native silver/eugenite, freibergite, ourayite, hessite, acanthite/argentite, stephanite and matildite.

## 13.3 Metallurgical Results: Master Composites

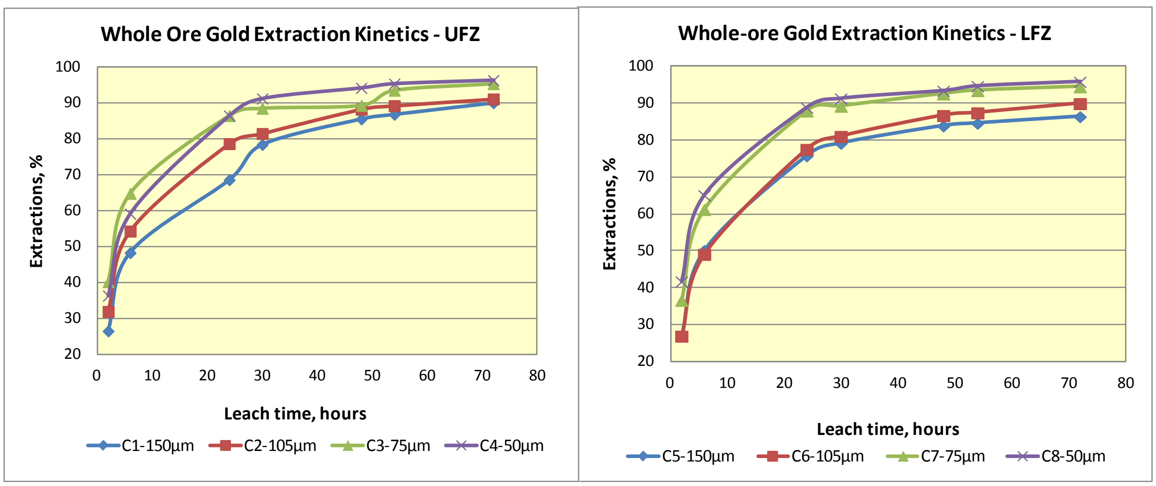
### 13.3.1 Whole-Ore Cyanidation

Whole-ore bottle roll cyanidation tests were conducted on the UFZ and LFZ master composites at sizes of 80% passing ($P_{80}$) of 150, 105, 75 and 50 µm to assess the effect of grind size on gold extraction, leach kinetics and reagent requirements. The leach tests were carried out at 40% solids for 72 hours at a cyanide concentration of 1.0 g/L NaCN with pH maintained at 10.5 to 11 with hydrated lime. The results of these tests are summarized in Table 13.3.1.1, and leach kinetics are presented in Figure 13.3.1.1. Gold extractions from the UFZ master composite ranged from 90.1% to 96.4% as the grind size became progressively finer. Gold extractions from the LFZ master composite ranged from 86.4% to 95.8% over the range of grind sizes tested. These test results indicate that the optimum grind size is about $P_{80}$ 75 µm.

**Table 13.3.1.1: Summary of Whole-Ore Cyanidation versus Grind Size**

| Composite ID | Test No | P80, µm | Measured Head Au (g/t) | Calculated Head Au (g/t) | Gold Recovery Au (%) | Residue Grade Au (g/t) | Consumption (kg/t) NaCN | Consumption (kg/t) Ca(OH)2 |
|---|---|---|---|---|---|---|---|---|
| UFZ Master Comp. | C1 | 149 | 1.54 | 1.82 | 90.1 | 0.18 | 1.58 | 0.25 |
| | C2 | 102 | 1.54 | 1.70 | 91.2 | 0.15 | 1.53 | 0.20 |
| | C3 | 77 | 1.54 | 1.42 | 95.4 | 0.07 | 1.56 | 0.20 |
| | C4 | 52 | 1.54 | 1.94 | 96.4 | 0.07 | 1.65 | 0.22 |
| LFZ Master Comp. | C5 | 151 | 1.55 | 1.84 | 86.4 | 0.25 | 1.74 | 0.13 |
| | C6 | 107 | 1.55 | 2.18 | 89.9 | 0.22 | 1.77 | 0.15 |
| | C7 | 75 | 1.55 | 2.17 | 94.5 | 0.12 | 1.77 | 0.14 |
| | C8 | 52 | 1.55 | 2.88 | 95.8 | 0.12 | 2.00 | 0.13 |

Source: Inspectorate, 2015




Source: Inspectorate, 2015

**Figure 13.3.1.1: Gold Extraction versus Leach Retention Time**

## 13.3.2 Gravity Concentration + Cyanidation of Gravity Tailing

**Gravity Concentration + Cyanidation versus Grind Size**

As an alternative process route to whole-ore cyanidation, a combination of gravity pre-concentration followed by cyanide leaching of gravity tails was investigated on the UFZ and LFZ master composites at grind sizes of $P_{80}$ 150, 105, 75 and 50 µm. The results of these tests are summarized in Table 13.3.2.1. Ground samples were subjected to single-pass gravity concentration with a Knelson centrifugal separator (Model KC-MD3). The Knelson rougher gravity concentrate was then hand-panned to simulate cleaning. The entire cleaner concentrate was fire assayed for gold. Combined pan tails and gravity tails were re-pulped to 40% solids and subjected to cyanide leaching using the same conditions as in whole-ore cyanidation tests.

**Table 13.3.2.1: Summary of Gravity + Cyanidation Tests versus Grind Size**

| Composite ID | Test No | P80, µm | Calculated Head Au (g/t) | Gold Recovery | | | Residue Grade Au (g/t) | Consumption (kg/t) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Gravity Au (%) | Cyanidation Au (%) | Overall Au (%) | | NaCN | Ca(OH)2 |
| UFZ Master Comp. | GC1 | 151 | 1.68 | 18.3 | 71.0 | 89.3 | 0.18 | 1.53 | 0.18 |
| | GC2 | 102 | 1.72 | 25.3 | 65.4 | 90.7 | 0.16 | 1.66 | 0.18 |
| | GC3 | 76 | 2.47 | 39.4 | 58.2 | 97.6 | 0.06 | 1.44 | 0.17 |
| | GC4 | 52 | 1.77 | 32.2 | 65.5 | 97.7 | 0.04 | 1.71 | 0.20 |
| LFZ Master Comp. | GC5 | 148 | 1.65 | 13.8 | 74.6 | 88.5 | 0.19 | 1.77 | 0.15 |
| | GC6 | 102 | 1.61 | 17.7 | 77.3 | 95.0 | 0.08 | 1.78 | 0.15 |
| | GC7 | 73 | 1.80 | 28.1 | 67.5 | 95.6 | 0.08 | 1.94 | 0.15 |
| | GC8 | 49 | 1.72 | 28.3 | 69.4 | 97.7 | 0.04 | 2.04 | 0.15 |

Source: Inspectorate, 2015

Results showed that both ore types were highly amenable to gravity separation, with up to 39.4% gold recovery from the UFZ composite and up to 28.3% gold recovery from the LFZ master composite into the gravity cleaner concentrate. The results of whole-ore cyanidation and gravity + cyanidation are compared in Table 13.3.2.2 where it can be seen that gravity + cyanidation led to slightly better gold recovery and lower residual gold grades at the same grind.

**Table 13.3.2.2: Comparison of Whole-Ore Cyanidation and Gravity + Cyanidation Results**

| Composite | Target P80 Size (µm) | Gold Recovery (% Au) | | Residual Grade (g/t Au) | |
|---|---|---|---|---|---|
| | | Whole-ore Cyanidation | Gravity + Cyanidation | Whole-ore Cyanidation | Gravity + Cyanidation |
| UFZ Master Composite | 150 | 90.1 | 89.3 | 0.18 | 0.18 |
| | 100 | 91.2 | 90.7 | 0.15 | 0.16 |
| | 75 | 95.4 | 97.6 | 0.07 | 0.06 |
| | 50 | 96.4 | 97.7 | 0.07 | 0.04 |
| LFZ Master Composite | 150 | 86.4 | 88.5 | 0.25 | 0.19 |
| | 100 | 89.9 | 95.0 | 0.22 | 0.08 |
| | 75 | 94.5 | 95.6 | 0.12 | 0.08 |
| | 50 | 95.8 | 97.7 | 0.12 | 0.04 |

Source: Inspectorate, 2015

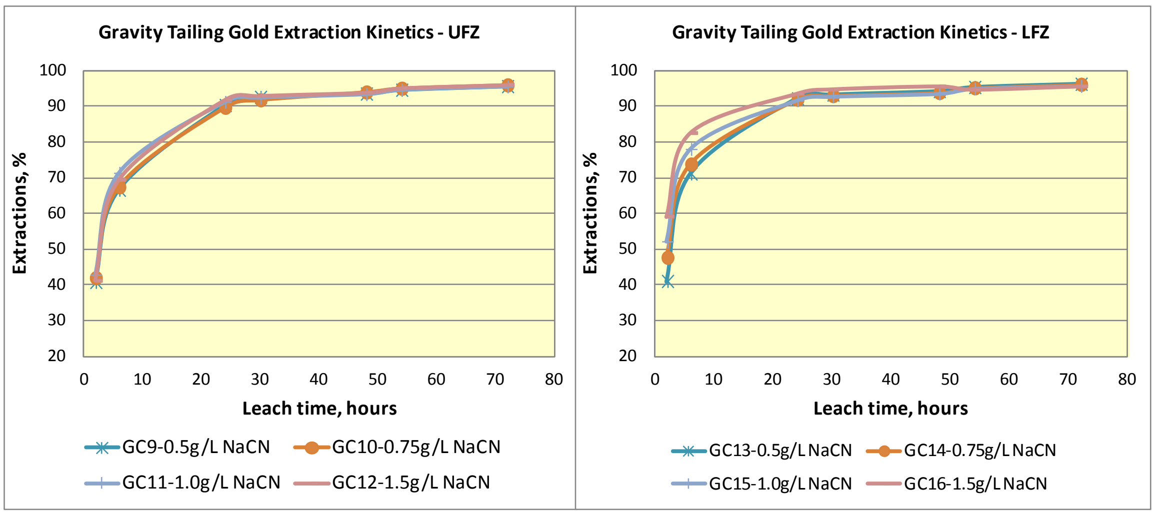
**<u>Gravity Concentration + Cyanidation of Gravity Tailings versus Cyanide Concentration</u>**

Gravity concentration + cyanidation of the gravity tailings versus cyanide concentration were evaluated on both master composites at the optimum primary grind of $P_{80}$ 75 µm. The cyanide concentration tests on each gravity tailing sample were carried out at 40% solids at cyanide concentrations of 0.5, 0.75, 1.0 and 1.5 g/L NaCN. The test results are summarized in Table 13.3.2.3. Increasing cyanide strength from 0.5 to 1.5 g/L resulted in negligible gains in gold recovery, with 96% to 97% gold recovery obtained regardless of the cyanide concentration, however, cyanide consumption was substantially reduced at the lower cyanide concentrations. Leach kinetics shown in Figure 13.3.2.1 indicate that a 48-hour residence time is sufficient for leaching gravity tailings.

**Table 13.3.2.3: Cyanidation of Gravity Tailings versus Cyanide Concentration**

| Composite ID | Test No | NaCN (g/L) | Calculated Head Au (g/t) | Gold Recovery | | | Residue Grade Au (g/t) | Consumption (kg/t) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Gravity Au (%) | Cyanidation Au (%) | Overall Au (%) | | NaCN | Ca(OH)2 |
| UFZ Master Comp. | GC9 | 0.50 | 1.79 | 25.9 | 70.8 | 96.7 | 0.060 | 0.78 | 0.22 |
| | GC10 | 0.75 | 1.79 | 26.2 | 70.7 | 96.9 | 0.055 | 1.17 | 0.20 |
| | GC11 | 1.00 | 1.78 | 26.2 | 70.4 | 96.6 | 0.060 | 1.28 | 0.20 |
| | GC12 | 1.50 | 1.74 | 27.4 | 69.7 | 97.1 | 0.050 | 1.53 | 0.20 |
| LFZ Master Comp. | GC13 | 0.50 | 1.79 | 27.5 | 69.7 | 97.2 | 0.050 | 0.92 | 0.16 |
| | GC14 | 0.75 | 1.86 | 25.9 | 71.2 | 97.0 | 0.055 | 1.43 | 0.16 |
| | GC15 | 1.00 | 1.82 | 26.0 | 70.8 | 96.7 | 0.060 | 1.66 | 0.15 |
| | GC16 | 1.50 | 1.82 | 25.8 | 70.9 | 96.7 | 0.060 | 2.23 | 0.15 |

Source: Inspectorate, 2015




Source: Inspectorate, 2015

**Figure 13.3.2.1: Gold Extraction from Gravity Tailings versus Retention Time**

## 13.3.3 Gravity Concentration + Flotation + Cyanidation

As an alternative process, gravity concentration followed by gold flotation from the gravity tailing and cyanidation of the flotation concentrate was investigated. This work included tests to evaluate:

- Gravity concentration;
- Rougher and cleaner flotation;
- Concentrate regrind; and
- Concentrate cyanidation.

The overall response to gravity + flotation + concentrate cyanidation and gold recovery in each process stage is summarized in Table 13.3.3.1. Large-scale gravity + rougher flotation testing with approximately 80 kg of each master composite resulted in a combined gold recovery of 95.9% from the UFZ master composite and 96.0% gold recovery from the LFZ master composite. This included 31.6% gravity gold recovery from the UFZ composite and 32.6% gold recovery from the LFZ composite. The gravity cleaner concentrate, representing approximately 0.01% of the original mass, contained greater than 4 kg/t Au and 3 kg/t Ag suitable for direct smelting. Rougher flotation concentrates containing 15% to 16% of the original mass were upgraded in one stage of cleaner flotation to produce a cleaner flotation concentrate that contained about 17 to 18 g/t Au and 34 to 72 g/t Ag. After one stage of cleaning, a combined gravity + cleaner flotation gold recovery of about 94% Au was achieved.

Cyanidation studies conducted on the cleaner flotation concentrates demonstrated that over 96% of the gold contained in the cleaner flotation concentrate could be extracted after 48 hours of leaching at a cyanide concentration of 1 g/L NaCN. This resulted in an overall gold recovery of 91.2% from the UFZ master composite and 92.5% gold recovery from the LFZ master composite at a cyanide consumption of 5 to 6 kg/t concentrate, equivalent to 0.3 to 0.4 kg/t ore.

**Table 13.3.3.1: Overall Gold Recoveries with Gravity + Flotation + Concentrate Cyanidation**

| Comp. ID | Process Stage | Mass Recovery (%) | Gold Recovery (%) |
|---|---|---|---|
| UFZ Master Comp. | Gravity concentration | 0.01 | 31.6 |
| | Gravity + Rougher flotation | 14.67 | 95.9 |
| | Gravity + Cleaner flotation | 5.83 | 93.3 |
| | **Gravity + Cleaner flotation + Concentrate cyanidation*** | **5.83** | **91.2** |
| LFZ Master Comp. | Gravity concentration | 0.01 | 32.6 |
| | Gravity + Rougher flotation | 16.20 | 96.0 |
| | Gravity + Cleaner flotation | 6.38 | 94.5 |
| | **Gravity + Cleaner flotation + Concentrate cyanidation** | **6.38** | **92.5** |

* At 30 wt.% solids in 1.0g/L, leach for 48 hours
Source: Inspectorate, 2015

## 13.4 Relevant Metallurgical Testwork: Variability Composites

Gravity + cyanidation and gravity + flotation were evaluated on the ten variability composites following the optimal conditions established from the two master composites to evaluate the impact of spatial and grade variations throughout the deposit.

### 13.4.1 Gravity + Cyanidation

The confirmatory gravity + cyanidation tests were carried out at the optimal grind $P_{80}$ of 75 µm, and a cyanide concentration of 0.5 g/L NaCN during cyanidation of the gravity tailings. The results of these tests are summarized in Table 13.4.1.1 and show that all ten variability composite samples are highly amenable to the gravity + cyanidation process. Gold recovery from the six UFZ variability composites varied from 93.5% to 96.8%, and averaged 95.5% including 35.2% gravity recoverable gold. Gold recovery on the three LFZ variability composites varied from 95.7% to 97.3%, and averaged 96.3% including 28.6% gold in the gravity circuit. In addition, gold recovery of 95.9% was also obtained from the saprolite composite.

**Table 13.4.1.1: Summary of Gravity + Cyanidation Results on Variability Composites**

| Test No | Comp. D | Calculated Head | | Recovery | | | | | | Residue Grade | | Consumption (kg/t) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Gravity | | Cyanidation | | Overall | | | | | |
| | | Au (g/t) | Ag (g/t) | Au (%) | Ag (%) | Au (%) | Ag (%) | Au (%) | Ag (%) | Au (g/t) | Ag (g/t) | NaCN | Ca(OH)2 |
| GC17 | UFZ-VC1 | 2.57 | 2.11 | 39.9 | 38.5 | 55.8 | 37.7 | 95.7 | 76.3 | 0.11 | 0.50 | 1.01 | 0.15 |
| GC18 | UFZ-VC2 | 0.96 | 1.57 | 34.0 | 27.3 | 62.3 | 40.8 | 96.3 | 68.2 | 0.04 | 0.50 | 1.03 | 0.81 |
| GC19 | UFZ-VC3 | 3.46 | 2.41 | 51.0 | 40.0 | 45.8 | 39.2 | 96.8 | 79.3 | 0.11 | 0.50 | 0.93 | 0.15 |
| GC20 | UFZ-VC4 | 1.08 | 1.45 | 19.8 | 10.8 | 73.7 | 54.7 | 93.5 | 65.5 | 0.07 | 0.50 | 1.01 | 0.15 |
| GC21 | UFZ-VC5 | 1.46 | 2.79 | 32.6 | 7.0 | 62.2 | 57.2 | 94.9 | 64.2 | 0.08 | 1.00 | 1.01 | 1.05 |
| GC22 | UFZ-VC6 | 3.65 | 6.96 | 33.5 | 21.1 | 62.4 | 50.2 | 95.9 | 71.3 | 0.15 | 2.00 | 1.11 | 0.13 |
| **UFZ Average** | | **2.20** | **2.88** | **35.2** | **24.1** | **60.4** | **46.6** | **95.5** | **70.8** | **0.09** | **0.83** | **1.01** | **0.41** |
| GC23 | LFZ-VC1 | 3.06 | 9.62 | 21.0 | 10.6 | 74.9 | 47.8 | 95.9 | 58.4 | 0.13 | 4.00 | 1.43 | 0.15 |
| GC24 | LFZ-VC2 | 0.94 | 3.88 | 19.8 | 3.0 | 76.0 | 45.5 | 95.7 | 48.5 | 0.04 | 2.00 | 0.94 | 0.15 |
| GC25 | LFZ-VC3 | 1.31 | 2.99 | 45.0 | 29.5 | 52.3 | 37.1 | 97.3 | 66.6 | 0.04 | 1.00 | 0.83 | 0.15 |
| **LFZ Average** | | **1.77** | **5.50** | **28.6** | **14.4** | **67.7** | **43.5** | **96.3** | **57.8** | **0.07** | **2.33** | **1.06** | **0.15** |
| GC26 | Saprolite Variability Comp. | 0.97 | 1.81 | 36.3 | 17.2 | 59.6 | 27.4 | 95.9 | 44.6 | 0.04 | 1.00 | 0.89 | 1.39 |
| **Overall Average** | | **1.95** | **3.56** | **33.3** | **20.5** | **62.5** | **43.8** | **95.8** | **64.3** | **0.08** | **1.30** | **1.02** | **0.43** |

Source: Inspectorate, 2015

## 13.4.2 Gravity + Flotation

Confirmatory gravity + flotation tests were conducted on each of the variability composites at a target primary grind $P_{80}$ of 75 µm and a target secondary grind $P_{80}$ of 40 µm. One stage gravity concentration followed by hand panning was first conducted on ground whole-ore to recover coarse gold. Flotation was then conducted on gravity-scalped tailings to recover the fine gold mainly associated with sulfide minerals. The results of these tests are summarized in Table 13.4.2.1 and show that most of the variability samples responded well to gravity + flotation, with the exception of the sample UFZ-VC5 and the Saprolite sample, in which a lower slurry pH of 5 to 6 was noted during flotation. Overall gold recovery from the UFZ and LFZ variability composites into the gravity + cleaner flotation concentrates ranged from 67.5% to 98.7% and averaged 90.9%. Overall gold recovery from the saprolite composite was 69.4%.

### Table 13.4.2.1: Summary of Gravity + Flotation Results on Variability Composites

| Summary for Gold | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test No | Sample ID | Gold Grade (g/t Au) | | | | | | | Gold Recovery (%) | | | Mass (%) | | |
| | | Meas. Head | Calc. Head | Gravity Cl. Conc. | Flotation Cl. Conc. | Flotation Ro. Conc. | Flotation Cl. Tails | Flotation Tails | Gravity | Gravity+Cl. Flotation | Gravity+Ro. Flotation | Gravity Cl. Conc. | Flotation Cl. Conc. | Flotation Ro. Conc. |
| GF21 | UFZ-VC1 | 2.07 | 2.37 | 543 | 30.58 | 15.17 | 0.28 | 0.12 | 22.5 | **94.8** | 95.5 | 0.10 | 5.6 | 11.4 |
| GF22 | UFZ-VC2 | 0.84 | 0.83 | 223 | 22.64 | 7.16 | 0.53 | 0.10 | 27.7 | **85.6** | 88.8 | 0.10 | 2.1 | 7.1 |
| GF23 | UFZ-VC3 | 2.36 | 3.59 | 1877 | 37.10 | 16.83 | 0.18 | 0.04 | 49.9 | **98.7** | 99.0 | 0.10 | 4.7 | 10.5 |
| GF24 | UFZ-VC4 | 1.22 | 1.38 | 456 | 19.59 | 8.59 | 0.12 | 0.03 | 30.1 | **97.5** | 98.1 | 0.09 | 4.8 | 11.0 |
| GF25 | UFZ-VC5 | 0.93 | 1.10 | 249 | 28.23 | 7.90 | 2.12 | 0.25 | 23.4 | **67.5** | 79.1 | 0.10 | 1.7 | 7.8 |
| GF26 | UFZ-VC6 | 2.87 | 3.60 | 981 | 37.24 | 22.47 | 0.25 | 0.09 | 29.5 | **97.5** | 97.8 | 0.11 | 6.6 | 10.9 |
| GF27 | LFZ-VC1 | 3.65 | 3.24 | 751 | 22.05 | 16.26 | 0.15 | 0.06 | 19.9 | **98.2** | 98.4 | 0.09 | 11.5 | 15.7 |
| GF28 | LFZ-VC2 | 1.29 | 0.59 | 167 | 12.57 | 4.61 | 0.17 | 0.08 | 24.5 | **86.1** | 87.6 | 0.09 | 2.9 | 8.1 |
| GF29 | LFZ-VC3 | 1.01 | 1.08 | 362 | 13.69 | 5.61 | 0.16 | 0.08 | 31.6 | **92.4** | 93.5 | 0.09 | 4.8 | 11.9 |
| **Ave. for Fresh Rock** | | **1.80** | **1.97** | **623** | **24.85** | **11.62** | **0.44** | **0.09** | **28.8** | **90.9** | **93.1** | **0.10** | **5.0** | **10.5** |
| GF30 | Saprolite Variability Comp. | 0.96 | 0.69 | 197 | 9.55 | 2.30 | 0.34 | 0.20 | 24.6 | **69.5** | 75.4 | 0.09 | 3.2 | 15.2 |

Source: Inspectorate 2015

## 13.5 Recovery Estimate Assumptions

Table 13.5.1 provides a summary of estimated gold recoveries achievable by each of the process options tested. Gold recovery achievable by a process flowsheet that includes gravity concentration followed by cyanidation is estimated at 95% from the UFZ and LFZ zones and 94% from the saprolite zones.

Gold recovery from a process flowsheet that includes gravity concentration followed by gold flotation from the gravity tailings and cyanide leaching of the flotation concentrate is estimated at 90% for the UFZ and LFZ zones and 65% for the saprolite zones. Estimated gold recoveries have been reduced by a 2% adjustment factor to allow for gold and silver losses that will occur during commercial operation due to plant inefficiencies.

**Table 13.5.1: Summary of Estimated Gold Recoveries from Process Options Tested**

| Process Option | Calc. Head Au (g/t) | Au Extraction (%) | Adjustment Factor | Au Recovery (%) |
|---|---|---|---|---|
| **Whole Ore Cyanidation** | | | | |
| UFZ Master Composite | 1.42 | 95 | 2 | 93 |
| LFZ Master Composite | 2.17 | 95 | 2 | 93 |
| **Gravity + Cyanidation** | | | | |
| UFZ Master Composite | 1.79 | 97 | 2 | 95 |
| LFZ Master Composite | 1.80 | 97 | 2 | 95 |
| Variability Composite (Average) | 2.13 | 96 | 2 | **94** |
| Saprolite | 0.97 | 96 | 2 | **94** |
| **Gravity + Flot + Cyan** | | | | |
| UFZ Master Composite | 1.75 | 91 | 2 | 89 |
| LFZ Master Composite | 1.78 | 93 | 2 | 91 |
| Variability Composite (Average) | 1.98 | 90 | 2 | **88** |
| Saprolite | 0.69 | 67 | 2 | **65** |

## 13.6 Significant Factors

Significant factors include:

- The metallurgical test program was conducted on two master composites formulated from available whole core intervals representing the UFZ and the LFZ, as well as selected variability composites.
- Three process options, including whole-ore cyanidation, a combination of gravity concentration followed by cyanidation of gravity tailing, and gravity concentration followed by gold flotation from the gravity tailing and cyanidation of the flotation concentrate, were investigated on two master composites, and the preferred process option and optimal conditions were further verified on ten variability test composites.
- Processing by gravity concentration followed by cyanidation of the gravity tailings yielded the highest overall gold recoveries and was selected at the preferred process option. Gold recovery is projected at about 95% with this process option.

# 14 Mineral Resource Estimate

## 14.1 Basis of Resource Estimation

The mineralization at Montagne d'Or is valued primarily for its gold content. There are however, localized zones with significant copper value. Only gold grades were estimated in the work described in this report.

Dr. Bart Stryhas constructed the geologic and mineral resource model discussed below. He is responsible for the resource estimation methodology, mineral resource classification and resource statement. Dr. Stryhas is independent of the issuer applying all of the tests in Section 1.5 of NI 43-101.

The resource estimation is based on the current drillhole database, interpreted lithologies, geologic controls and current topographic data. The resource estimation is supported by drilling and sampling current to April 11, 2015. The estimation of mineral resource was completed utilizing computerized resource block model constructed using Vulcan™ modeling software.

## 14.2 General Geology

The Montagne d'Or deposit is an Archean age gold deposit that has undergone remobilization and shear zone style deformation. The deposit is located within the northern greenstone belt of the Guiana Shield. Mineralization is hosted within the two billion year old, Paramaca Formation composed predominantly of metavolcanic and metasedimentary units. These units have been deformed by folding and ductile shearing which has developed a pervasive foliation striking east-west and dipping steeply to the south. The current model of gold mineralization is a high sulfidization, volcanogenic (VMS) type. Significant portions are thought to have been emplaced as replacement style mineralization. Subsequently, the mineralization has been deformed and partly remobilized within structural controls. Gold mineralization is associated with primary sulfide minerals as replacements within pyrite and chalcopyrite. At a macroscopic scale, the following five types of mineralization have been identified in mapping and drill core logging:

- Semi-massive sulfides (SMS, >20% sulfides) with associated gold mineralization;
- Sulfides as disseminations and stringers with associated gold mineralization;
- Late-stage disseminated euhedral pyrite mineralization;
- Rhythmic mafic tuff with associated pyrrhotite mineralization; and
- Gold mineralization associated with quartz veins.

## 14.3 Controls on Gold Mineralization

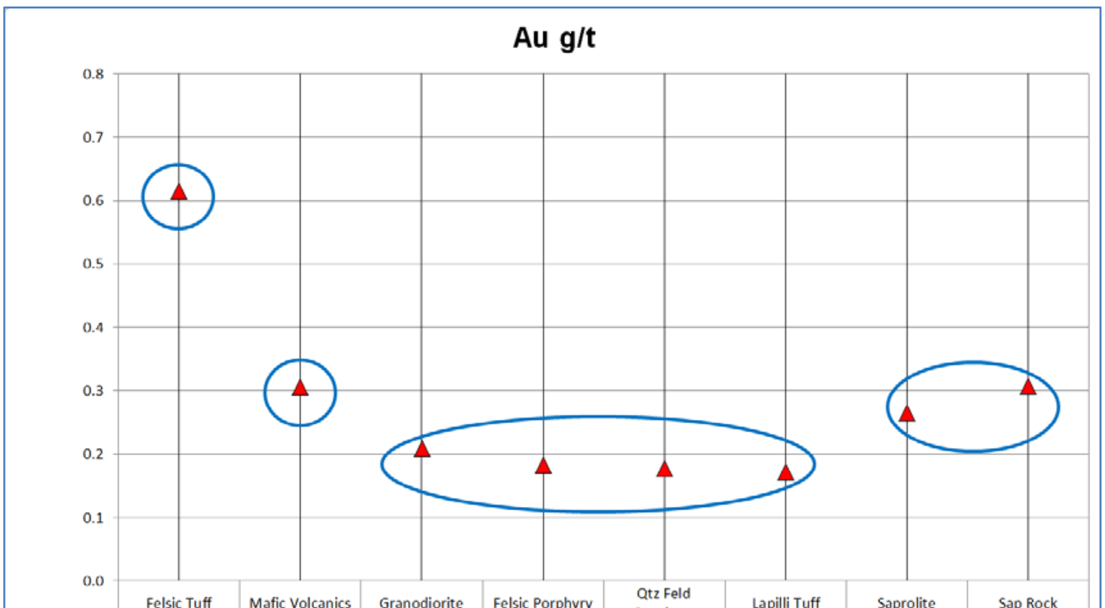
Gold mineralization is controlled mainly by structural fabric and lithology. The mineralization is localized in planar zones which have recurrent distribution and highly variable grades. Anomalous gold grades typically occur in zones 3 m to 10 m wide which are separated by barren or lower grade zones 10 m to 30 m wide. This is a common occurrence in these types of deposits and it is very important to consider this fact when designing reliable resource estimation. The orientation of this preferred plane of mineralization has been identified and refined over the past several years of drilling. Columbus has recently undertaken a program of oriented core drilling which has provided valuable information to better understand the structural geology of the deposit. All structural orientation data to date was acquired and plotted on lower hemisphere stereonets. The structural fabric data includes; foliation, shear planes, lithologic contacts and veins. The results of the stereonet plots are summarized in Table 14.3.1 and the actual stereonets are presented in Appendix A. The preliminary results confirm that the preferred orientation of mineralization as interpreted by Columbus, does follow along the average foliation and shear planes.

**Table 14.3.1: Average Orientations of Structural Fabrics**

| Fabric | Strike | Dip ° | # Measurements |
|---|---|---|---|
| Foliation | N86E | -70S | 1,119 |
| Shear Planes | N90E | -74S | 35 |
| Contacts | N83E | -70S | 785 |
| Veins | N87E | -71S | 878 |

Source: SRK, 2015

As part of the most recent drilling campaign, most of the historic core was relogged to create a unified system of lithologic descriptions. This has resulted in a detailed, 3-D geologic model created by using ARANZ Leapfrog® Geo software (Leapfrog®). To illustrate the importance of lithologic control of mineralization, SRK constructed a box plot of gold values in the drillholes database subdivided by lithology. The results are presented in Figure 14.3.1. The box plot shows four relative levels of mineralization controlled by lithology. Each of these four lithic types or groups were geologically modelled and estimated independently.




| | Felsic Tuff | Mafic Volcanics | Granodiorite | Felsic Porphyry | Qtz Feld Porphyry | Lapilli Tuff | Saprolite | Sap Rock |
|---|---|---|---|---|---|---|---|---|
| Q1 | 0.030 | 0.010 | 0.010 | 0.010 | 0.012 | 0.030 | 0.020 | 0.018 |
| Min | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.002 | 0.000 | 0.000 |
| Median | 0.090 | 0.020 | 0.028 | 0.020 | 0.032 | 0.051 | 0.055 | 0.050 |
| ▲Mean | 0.616 | 0.306 | 0.208 | 0.182 | 0.178 | 0.173 | 0.265 | 0.307 |
| −Max | 163.000 | 70.990 | 62.500 | 31.260 | 9.560 | 11.074 | 29.154 | 81.400 |
| Q3 | 0.318 | 0.084 | 0.080 | 0.060 | 0.100 | 0.100 | 0.177 | 0.160 |
| NSamples | 21188 | 8918 | 11678 | 997 | 977 | 858 | 5598 | 2004 |

Source: SRK, 2015

**Figure 14.3.1: Box Plot of Gold Grade by Lithology**

## 14.4 Density

Density testing was performed on the drill core during 2007 and from 2011 to 2014, a total of 3,323 density measurements were taken from all lithic varieties by onsite personnel. The averages of each lithology are listed in Table 14.4.1. These densities were assigned in the block model based on the lithology of the block.

**Table 14.4.1: Densities Assigned in the Block Model**

| Rock Type | Number of Measurements | Average Density g/cm$^3$ |
|---|---|---|
| Saprolite | 354 | 1.695 |
| Saprolite-Rock Transition | 193 | 2.365 |
| Felsic Tuff | 1,056 | 2.911 |
| Mafic Volcanics | 413 | 3.154 |
| Granodiorite | 615 | 2.754 |
| Feldspar Porphyry | 61 | 2.786 |
| Quartz-Feldspar Porphyry | 164 | 2.817 |
| Lapilli Tuff | 75 | 2.864 |
| Diabase Dikes | 392 | 3.016 |

Source: SRK, 2015

## 14.5 Sample Database

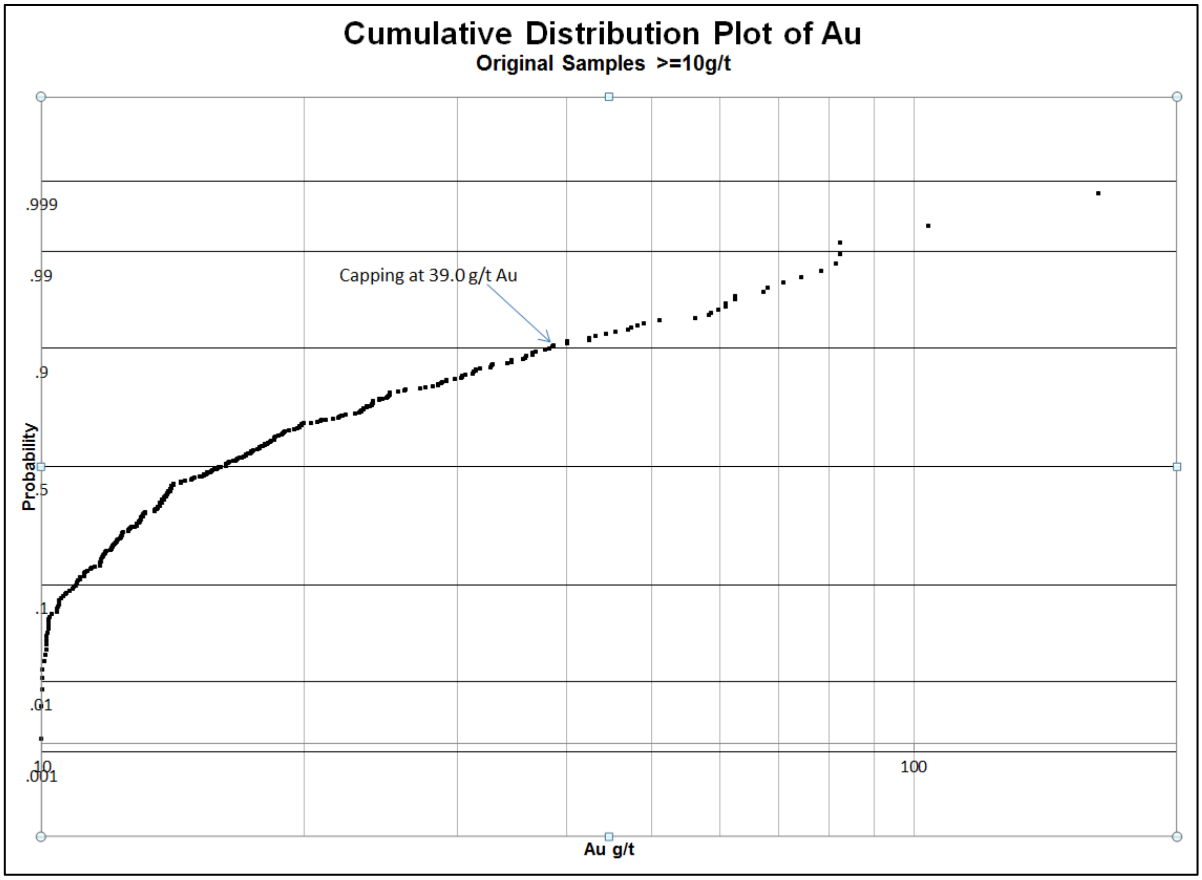
The April 11, 2015 database contains information from 224 diamond drillholes and 37 channel samples. The drilling was completed in two main campaigns. A previous owner drilled 56 holes between 1996 and 1998. Columbus completed an additional 168 holes from 2011 to April, 2015. The channel samples were all collected from surface between 1995 and 1997. SRK has previously reviewed the 1995 through 1998 exploration data and found it to be of sufficient quality to support an industry standard, resource estimation.

The database includes four excel files containing information on collar locations, downhole surveys, lithology and gold assays. There are 49,513 valid entries in the assay file with an average sample length of 1.03 m.

## 14.6 Capping and Compositing

The original drillhole gold values were assessed for statistical outliers using a lognormal cumulative distribution plot and decile analysis. The decile analysis was used to identify the appropriate bin range for capping and the cumulative distribution plot was used to define the final capping level. The results of the cumulative distribution plot are presented in Figure 14.6.1. The Au capping level was chosen at 39 g/t mainly because this is the point where the cumulative distribution trends lose continuity and the data values above, show irregular distribution. The Au capping resulted in 25 samples ranging from 40.1 g/t to 163 g/t being reduced to 39 g/t prior to compositing. This was a net loss of 3% of all gold in the database.

Compositing was completed in 3 m downhole lengths with no breaks at lithologic contacts. The 3 m length was chosen as an appropriate size for two reasons. This length includes three original assay intervals so that it provides some smoothing of the data while still preserving the recurrent nature of the gold mineralization. The 3 m composite length also results in approximately two composites being included within the diagonal intersection of the 5 m, Y direction block size.




Source: SRK, 2015

**Figure 14.6.1: Log Normal Cumulative Distribution Plot of Gold Assays above 10 g/t**

## 14.7 Block Model

The block model limits of the SRK resource estimations are listed below. The block dimensions are based on a compromise between the average drill hole spacing, a typical open pit selective mining unit, the variability of the mineralization and computational efficiency of keeping the model under ten million blocks. The block model limits and block sizes are listed in Table 14.7.1. There are 7,086,240 blocks in the model.

**Table 14.7.1: Block Model Size and Extents**

| Orientation | Minimum (m) | Maximum (m) | Block Dimension (m) |
|---|---|---|---|
| Easting | 172,200 | 175,160 | 10 |
| Northing | 520,200 | 521,150 | 5 |
| Elevation (AMSL) | -150 | 480 | 5 |

Source: SRK, 2015

## 14.8 Estimation Strategy

Columbus constructed Leapfrog® software generated wireframe solids which enclose anomalous gold mineralization at a 0.3 g/t Au threshold. The grade shell was checked for validity using two methods. First, it was queried to determine how many samples within it fall above the 0.3 g/t threshold. The query showed that 79% of the samples within the grade shell were above the threshold. Next, it was visually inspected to be sure the geometry was reasonable, based on the nearby drillholes. Four rock types/groups were used as shown in Figure 14.3.1. Each rock type/group was estimated independently both internal and external to the grade shell using only samples from the same domain. The resultant grade estimation was therefore conducted in eight domains. As discussed in Section 14.3, the gold mineralization is strongly controlled by thin planar zones. These generally strike east-west and dip approximately -68° south. To estimate metal grades along this orientation, trend planes were constructed which mark the hanging wall and foot wall to the significant mineralization. The search ellipsoid used for each model block paralleled these trend surfaces. This creates a dynamic search anisotropy which varied according to the average orientation of the shear zone throughout the block model. An Inverse Distance Weighting Squared ($IDW^2$) algorithm was used for the grade estimations since the variograms have very high nugget values and short ranges.

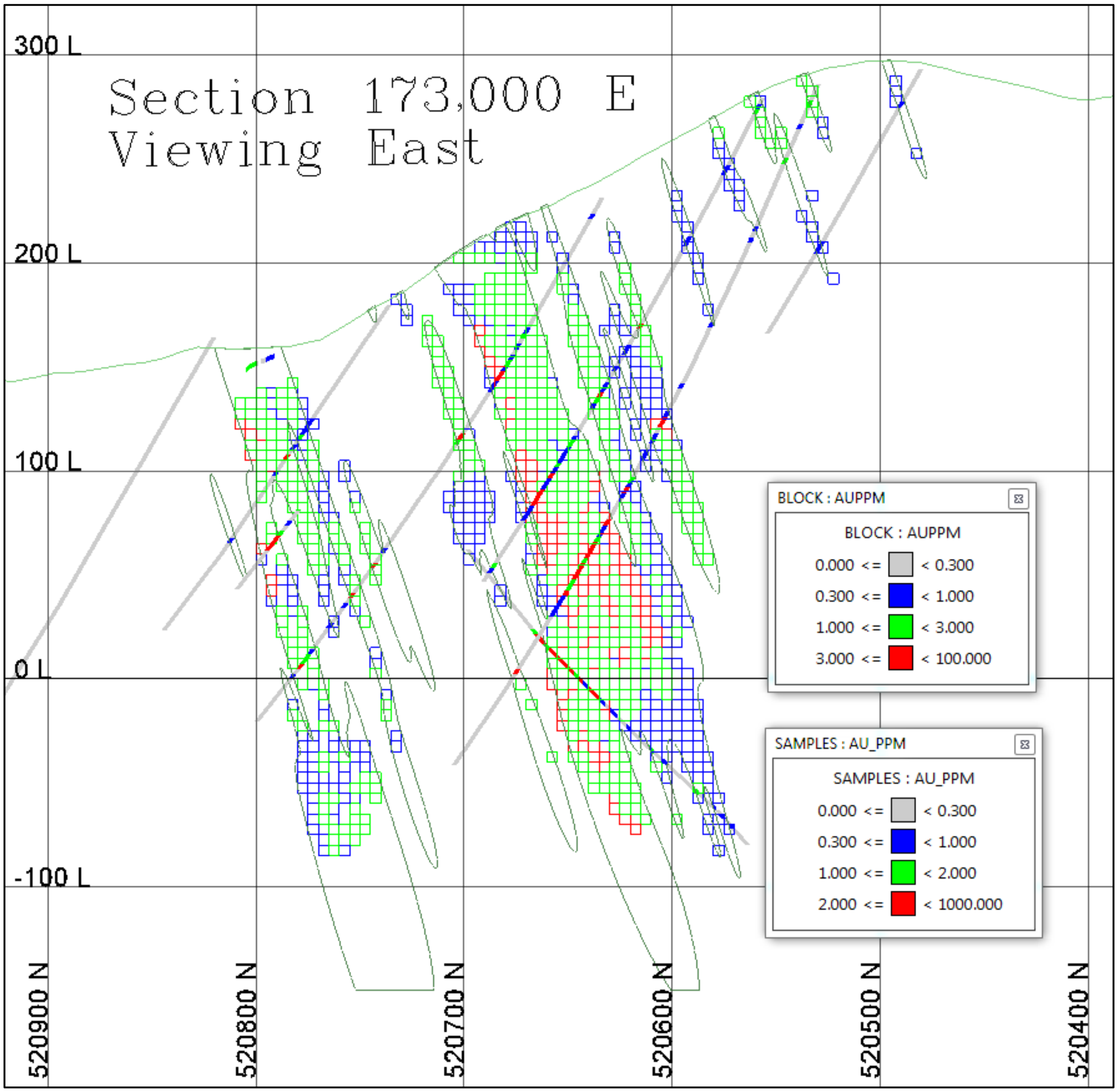
## 14.9 Estimations Procedures

The grade estimations for all metals in all domains utilize a four pass sample search strategy with each pass searching longer distances than the previous. In each domain, all blocks located within 75 m to the closest sample were identified and grade was only estimated in these blocks. Because the grade shell and distance restriction has been predetermined; and mineralized blocks are now isolated from less-mineralized blocks, the model is allowed to search relatively long distances in the preferred plane of mineralization and the direction normal to it. This method provides for a larger pool of composites to be considered resulting in appropriate grade smoothing. The search distances and sample selection criteria are listed in Table 14.9.1. Sample length weighting is used in all estimations to account for any short composites located at the ends of drillholes. As part of the grade estimation, model validation is conducted as an interactive process. To achieve proper validation, some higher grade composites were limited by the distance they could be interpolated. A high-grade composite restriction, as listed in Table 14.9.1, means that any sample above the listed grade could only be interpolated over the listed distance. Figures 14.9.1 and 14.9.2 show representative cross sections of the gold and copper estimation results.

**Table 14.9.1: Au Grade Estimation Parameters**

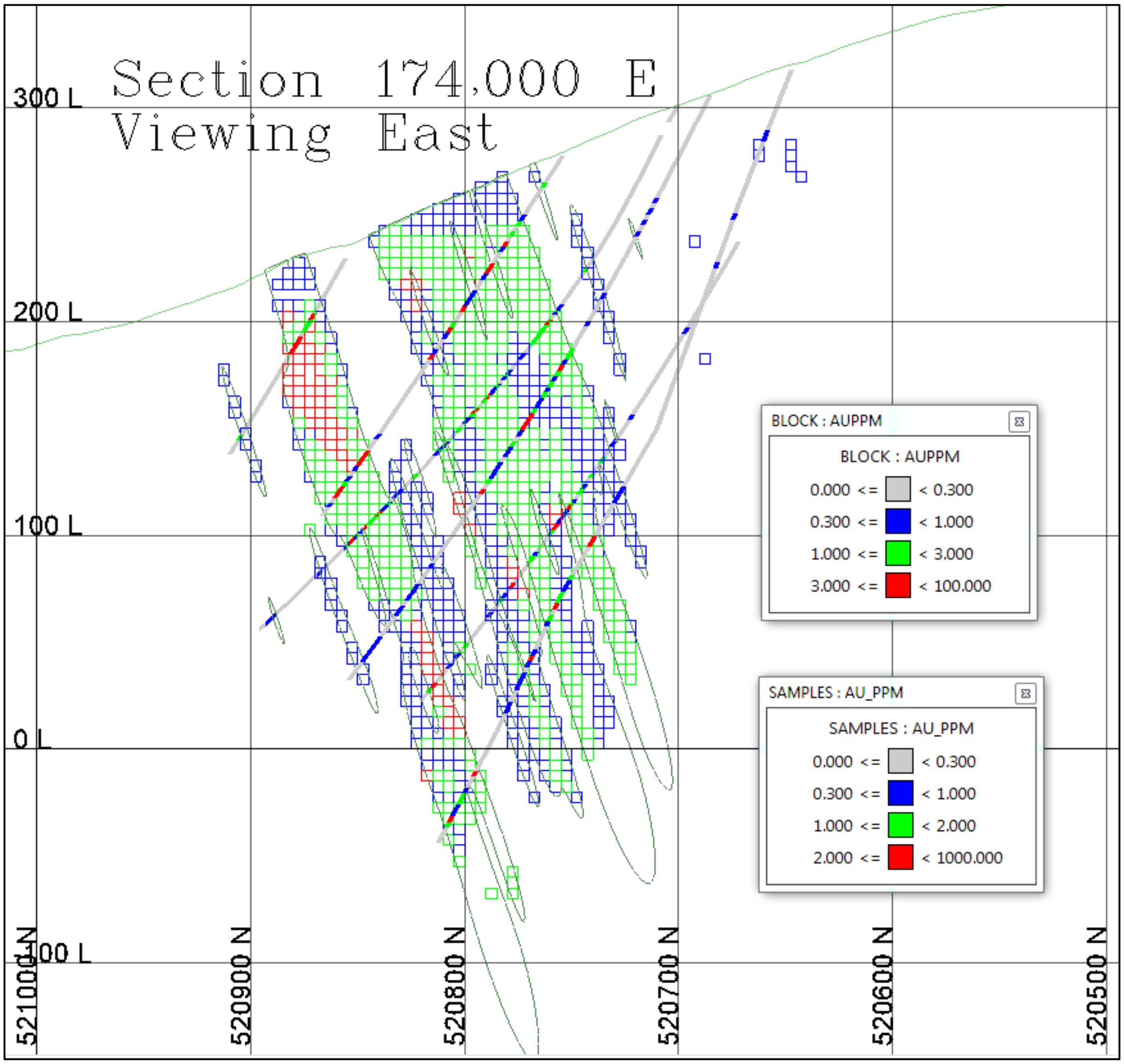
| Estimation | Estimation Pass | Search Range (x,y,z) m | Min/Max Samples | Octant Restriction | High Grade Composite Restriction(grade. x, y, z distances) |
|---|---|---|---|---|---|
| Saprolite/Sap Rock Inside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 35,35,5 | 3/8 | 2 Samp/Octant | None |
| | 3 | 65,65,10 | 3/8 | 2 Samp/Octant | >5.5 g/t <35 m, 35 m, 5 m |
| | 4 | 125,125,15 | 3/8 | 2 Samp/Octant | >5.5 g/t <35 m, 35 m, 5 m |
| Saprolite/Sap Rock Outside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 50,50,25 | 1/8 | 2 Samp/Octant | |
| Felsic Tuff Inside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 35,35,5 | 3/8 | 2 Samp/Octant | None |
| | 3 | 65,65,10 | 3/8 | 2 Samp/Octant | >15 g/t <35 m, 35 m, 5 m |
| | 4 | 125,125,15 | 3/8 | 2 Samp/Octant | >15 g/t <35 m, 35 m, 5 m |
| Felsic Tuff Outside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 25,25,5 | 1/8 | 2 Samp/Octant | |
| Mafic Volcanics Inside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 35,35,5 | 3/8 | 2 Samp/Octant | |
| | 3 | 65,65,10 | 3/8 | 2 Samp/Octant | >9.0 g/t <35 m, 35 m, 5 m |
| | 4 | 125,125,15 | 3/8 | 2 Samp/Octant | >9.0 g/t <35 m, 35 m, 5 m |
| Mafic Volcanics Outside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 25,25,5 | 1/8 | 2 Samp/Octant | |
| Other Lithologies Inside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 35,35,5 | 3/8 | 2 Samp/Octant | None |
| | 3 | 65,65,10 | 3/8 | 2 Samp/Octant | >6.0 g/t <35 m, 35 m, 5 m |
| | 4 | 125,125,15 | 3/8 | 2 Samp/Octant | >6.0 g/t <35 m, 35 m, 5 m |
| Other Lithologies Outside Grade Shell | 1 | 5,2.5,2.5 (Box) | 1/3 | None | None |
| | 2 | 25,25,5 | 1/8 | 2 Samp/Octant | |

Source: SRK, 2015




Source: SRK, 2015

**Figure 14.9.1: Representative Cross Section 173,000E with Estimated Au Grades**




Source: SRK, 2015

**Figure 14.9.2: Representative Cross Section 174,000E with Estimated Au Grades**

# 14.10 Model Validation

Five techniques were used to evaluate the validity of the block model. First, the interpolated block grades were visually checked on sections, plan views and in 3-D for comparison to the composite assay grades. Second, the general model estimation parameters were reviewed to evaluate the performance of the model with respect to supporting data. This included the number of composites used, number of drillholes used, average distance to samples used, and the number of block estimated in each pass. The results of this analysis are presented in Table 14.10.1. Third, statistical analyses were made comparing the estimated block grades from the $IDW^2$ estimation to the composite sample data supporting the estimation. Table 14.10.2 lists the results of the statistical comparison. In all cases, the block grades are very close to, or slightly below, the composite grades as desired. Fourth, a nearest neighbor estimation was run using a single composite to estimate each block using the same parameters as the $IDW^2$ estimation. The total contained metal, at a zero CoG in the nearest neighbor estimation, is compared to the $IDW^2$ estimation at the same cut-off. The results of this comparison are listed in Table 14.10.3. The final validation was to construct N-S oriented swath plots located every 50 m spacing. The results shown in Figure 14.10.1 illustrate strong correlation between block grades and composites with an appropriate amount of smoothing.

**Table 14.10.1: Estimation Performance Parameters of Au Estimation in Grade Shell**

| Estimation | Samples Used (#) | Drillholes Used (#) | Average Distance to Samples (m) | Blocks Estimated (%) |
|---|---|---|---|---|
| Pass 1 | 1.4 | 1 | 2.7 | 2 |
| Pass 2 | 4.1 | 2.3 | 21 | 53 |
| Pass 3 | 4.7 | 2.6 | 38 | 22 |
| Pass 4 | 5.3 | 3.0 | 69 | 23 |
| All Passes | 4.5 | 2.5 | 35 | 100 |

Source: SRK, 2015

**Table 14.10.2: Model Validation Statistical Results in Grade Shell**

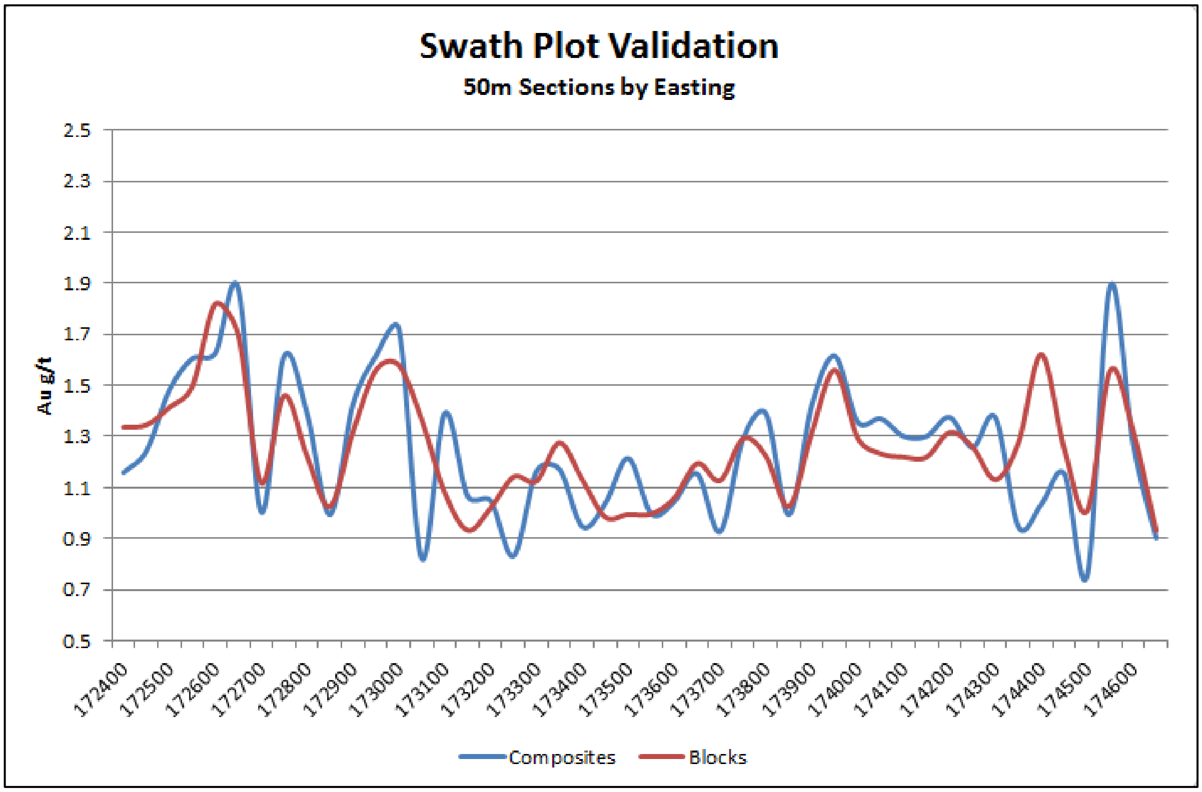
| Estimation | Average Composite Grade (g/t) | Average Block Grade (g/t) | Difference of Composites to Blocks (%) |
|---|---|---|---|
| Saprolite/Sap Rock | 0.932 | 0.851 | 8.7 |
| Felsic Tuff | 1.479 | 1.389 | 6.1 |
| Mafic Volcanics | 1.306 | 1.270 | 2.8 |
| Other Lithologies | 0.804 | 0.780 | 3.0 |
| All Lithologies | 1.263 | 1.255 | 0.6 |

Source: SRK, 2015

**Table 14.10.3: Model Validation nearest Neighbor Results in Grade Shell**

| Estimation | Cut-off (g/t) | Tonnes (M) | $IDW^2$ Grade (g/t) | NN Au Grade (g/t) | % Difference of Metal Mass, $IDW^2$ to NN |
|---|---|---|---|---|---|
| Saprolite/Sap Rock | 0 | 8.3 | 0.8527 | 0.8194 | 3.9 |
| Felsic Tuff | 0 | 87.4 | 1.3891 | 1.3936 | -0.3 |
| Mafic Volcanics | 0 | 19.7 | 1.2698 | 1.2748 | -0.4 |
| Other Lithologies | 0 | 13.4 | 0.7799 | 0.7544 | 3.3 |
| All Lithologies | 0 | 128.8 | 1.2729 | 1.2719 | 0.1 |

Source: SRK, 2015



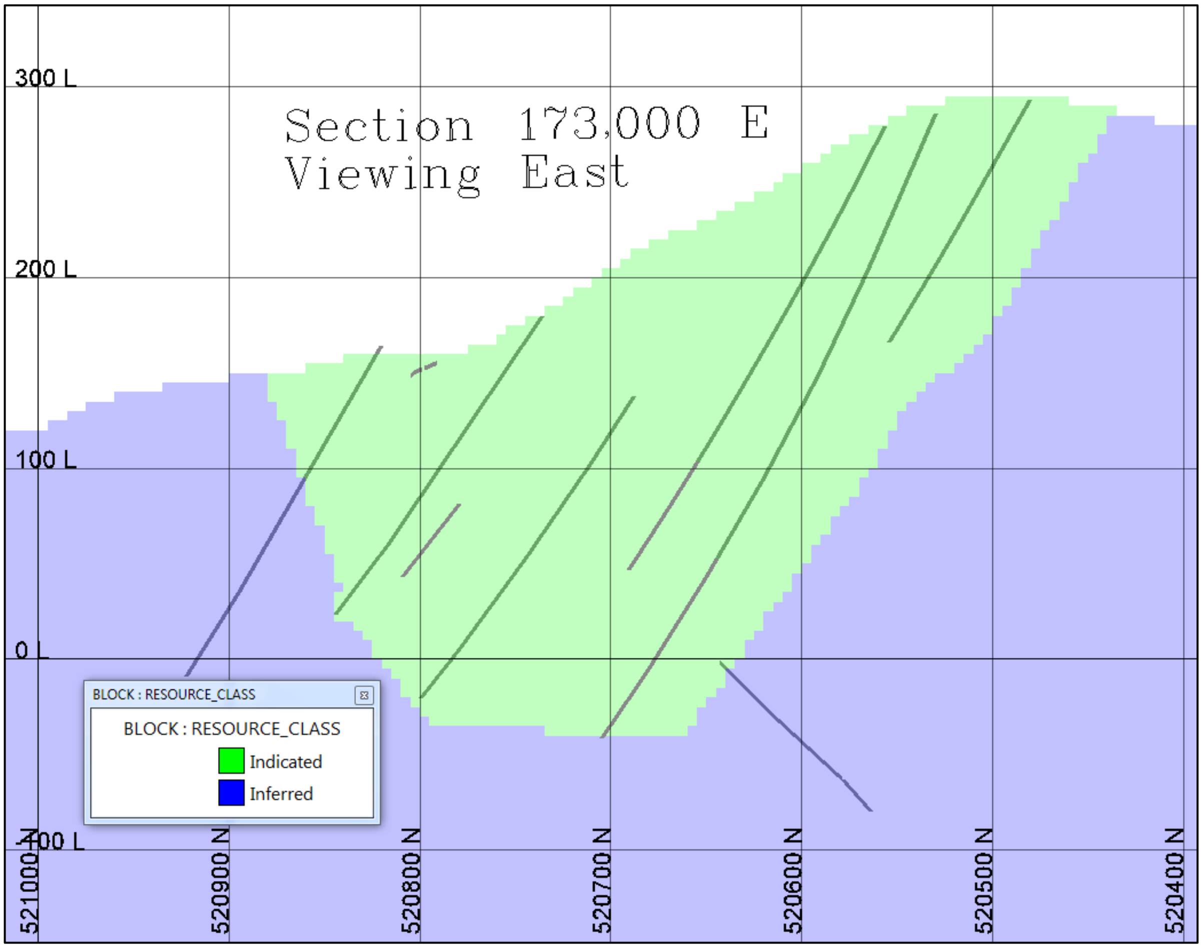

Source: SRK, 2015

**Figure 14.10.1 North-South Oriented Swath Plots**

## 14.11 Resource Classification

Mineral Resources are classified under the categories of Measured, Indicated and Inferred according to CIM guidelines. Classification of the mineral resources reflects the relative confidence of the grade estimates and the continuity of the mineralization. This classification is based on several factors including sample spacing relative to geological and geo-statistical observations regarding the continuity of mineralization, data verification to original sources, specific gravity determinations, accuracy of drill collar locations, accuracy of topographic data, quality of the assay data and many other factors which influence the confidence of the mineral estimation. No single factor controls the mineral resource classification, rather each factor influences the end result.

The mineral resources reported for the Montagne d'Or deposit are classified as Indicated and Inferred Mineral Resources. This is based primarily on drillhole spacing since all other supporting data is of good quality. Wire frame solids were constructed around the areas where the average drillhole spacing is approximately 50 m or less and these were used to assign the Indicated Mineral Resource classification. All blocks outside of these wireframes were classified as Inferred Mineral Resources. Figure 14.11.1 shows a representative cross section of the Mineral Resource classification.




Source: SRK, 2015

**Figure 14.11.1: Representative Cross Section of Resource Classification**

## 14.12 Mineral Resource Statement

The Montagne d'Or Mineral Resource statement is presented in Table 14.12.1. The resource is confined within a Whittle ™ optimization pit shell and a CoG of 0.4 g/t Au applied. The pit shell and CoG assumes open-pit mining methods and is based on a mining cost of US$1.50/t, milling cost of US$15.00/t, administration cost of US$1.00/t, a gold price of US$1,300/oz., 90% gold recovery, gold refining cost of US$8.00/oz, and 5% NSR royalty. A 45° pit shell slope was used for bedrock and a 35° pit shell slope was used for saprolite. The reported Mineral Resources include material from all estimation domains.

**Table 14.12.1: Montagne d'Or Mineral Resource Statement as of April 11, 2015 SRK Consulting (U.S.), Inc.***

| Classification | Au Cut-Off (g/t) | Tonnes (M) | Au (g/t) | Contained Au (M oz) |
|---|---|---|---|---|
| Indicated | 0.40 | 83.24 | 1.455 | 3.893 |
| Inferred | 0.40 | 22.37 | 1.550 | 1.115 |

Note: Mineral resources are not ore reserves and do not have demonstrated economic viability. All figures rounded to reflect the relative accuracy of the estimates. Metal assays were capped where appropriate. Mineral Resources are reported based on a CoG of 0.4 g/t Au, and are reported inside a conceptual pit shell based on appropriate mining and processing costs and metal recoveries for oxide and sulfide material. CoGs are based on a mining cost of US$1.50/t, milling cost of US$15.00/t, administration cost of US$1.00/t, a gold price of US$1,300/oz., 90% gold recovery, gold refining cost of US$8.00/oz, and 5% NSR royalty
Source: SRK, 2015

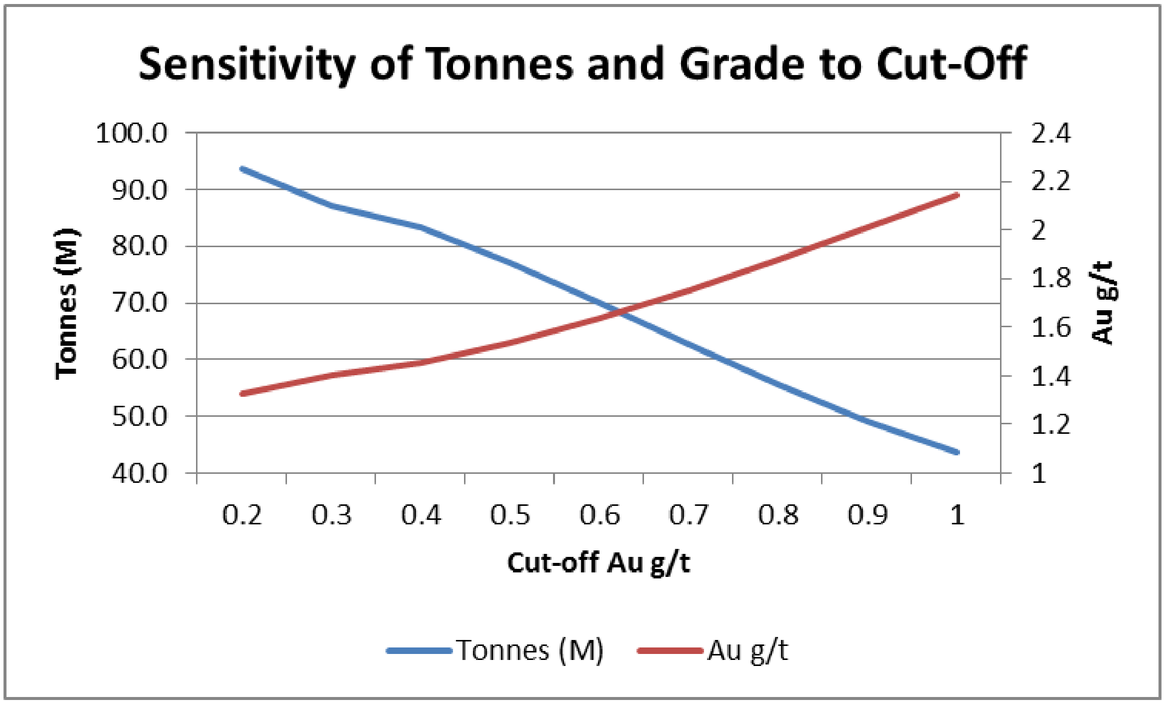
# 14.13 Mineral Resource Sensitivity

In Table 14.13.1 below, the Mineral Resources are presented at a range of cut off grades, subdivided by resource classification. Graphical representations of the grade and tonnage sensitivities of the indicated resources are presented in Figure 14.13.1. All resources are confined within the Whittle optimization pit shell.

**Table 14.13.1 Mineral Resource Sensitivity****

| **Indicated** | | | |
|---|---|---|---|
| **Cut-off** | **Tonnes (M)** | **Au (g/t)** | **Au (M oz)** |
| 0.2 | 93.7 | 1.325 | 3.99 |
| 0.3 | 87.2 | 1.405 | 3.94 |
| **0.4*** | 83.2 | 1.455 | 3.89 |
| 0.5 | 77.1 | 1.536 | 3.81 |
| 0.6 | 70.1 | 1.634 | 3.68 |
| 0.7 | 62.5 | 1.753 | 3.53 |
| 0.9 | 55.6 | 1.878 | 3.36 |
| 1.0 | 49.1 | 2.013 | 3.18 |
| **Inferred** | | | |
| **Cut-off** | **Tonnes (M)** | **Au (g/t)** | **Au (M oz)** |
| 0.2 | 24.2 | 1.455 | 1.13 |
| 0.3 | 23.1 | 1.510 | 1.12 |
| **0.4*** | 22.4 | 1.550 | 1.11 |
| 0.5 | 21.3 | 1.605 | 1.10 |
| 0.6 | 19.8 | 1.683 | 1.07 |
| 0.7 | 18.2 | 1.773 | 1.04 |
| 0.9 | 16.5 | 1.883 | 1.00 |
| 1.0 | 14.8 | 1.998 | 0.95 |

* Base case CoG
** Tonnes and grade have been rounded to reflect the level of expected accuracy
Source: SRK, 2015




Source: SRK, 2015

**Figure 14.13.1: Sensitivity of Tonnes and Grade to Cut-off**

# 15 Mineral Reserve Estimate

There are currently no mineral reserves for the Project, based on the current level of study.

# 16 Mining Methods

SRK has not reviewed mining methods as part of the current study. For the current study SRK has assumed all mining will take place via open pit methodology. More work will be required to define which mining methods would best suit the deposit. The company plans to announce the results of a PEA in the near future.

# 17 Recovery Methods

SRK has reviewed the recovery method as part of the current study as disclosed in Section 13 of this current report. The selected metal recovery is based on the initial metallurgical testwork completed to date

# 18 Project Infrastructure

SRK has not reviewed Project Infrastructure as part of the current study. The company plans to announce the results of a PEA in the near future.

# 19 Market Studies and Contracts

SRK has not completed a market study and contracts review as part of the current study. The company plans to announce the results of a PEA in the near future.

# 20 Environmental Studies, Permitting and Social or Community Impact

SRK has not completed a detailed environmental study as part of the current study. Work on the environmental studies and permitting are ongoing.

# 21 Capital and Operating Costs

SRK has not reviewed Capital and Operating cost requirements as part of the current study. The company plans to announce the results of a PEA in the near future. The optimization parameters were selected based on experience and benchmarking against similar projects.

# 22 Economic Analysis

SRK has not completed a detailed economic study as part of the current study. The company plans to announce the results of a PEA in the near future.

# 23 Adjacent Properties

There are no significant properties adjacent to the Montagne d'Or prospect.

# 24 Other Relevant Data and Information

There is no known data or information relevant to this report that is not disclosed.

# 25 Interpretation and Conclusions

## 25.1 Geology and Resources

Geology and resources interpretations and conclusions are:

- Columbus has completed an industry standard exploration drilling program over an area of approximately 1 1/4 $km^2$;
- The results of the drilling have supported an industry standard resource estimation; and
- Whittle™ pit shell optimizations host an Indicated Mineral Resource of 83 Mt at an average Au grade of 1.455 g/t containing 3.9 Moz of gold and an additional Inferred Mineral Resource of 22 Mt at an average Au grade of 1.550 g/t containing 1.1 Moz of gold.

## 25.2 Metallurgy

Metallurgical interpretation and conclusions are:

- The metallurgical test program was conducted on two master composites formulated from available whole core intervals representing the UFZ and the LFZ, as well as selected variability composites.
- Three process options, including whole-ore cyanidation, a combination of gravity concentration followed by cyanidation of gravity tailing, and gravity concentration followed by gold flotation from the gravity tailing and cyanidation of the flotation concentrate, were investigated on two master composites, and the preferred process option and optimal conditions were further verified on ten variability test composites.
- Processing by gravity concentration followed by cyanidation of the gravity tailings yielded the highest overall gold recoveries and was selected at the preferred process option. Gold recovery is projected at about 95% with this process option.

# 26 Recommendations

## 26.1 Recommended Work Programs and Costs

### 26.1.1 Exploration Drilling

A multitask exploration drilling program is proposed. The program will target infill drilling in the areas of the proposed starter pit, infill drilling in the saprolite material and condemnation drilling in the potential areas of infrastructure.

The infill drilling program would be on a 25 m x 50 m grid spacing in the proposed area of the current resource starter pit. The drillholes are proposed to range from 35 to 320 m in length. Many of the holes would be drilled by RC to the maximum depth achievable and then taken to final depth with core. A total of 17,750 m in 123 drillholes would be required.

The condemnation drilling program will cover three areas of infrastructure including, proposed plant site, proposed waste rock site and the proposed tailings facility. The condemnation drilling would be on a 55 m grid pattern and would consist of 75 m long inclined holes at -55 to the north or north east. A total of 4,900 m in 65 drillholes would be required.

### 26.1.2 Costs

**Table 26.1.2.1: Summary of Exploration Drilling Costs for Recommended Work**

| Item | Units (m) | US$/Unit | Cost (US$) |
|---|---|---|---|
| Infill RC Drilling | 10,000 | 55 | 550,000 |
| Infill Core Drilling | 4,800 | 115 | 550,000 |
| Condemnation Drilling | 4,900 | 55 | 270,000 |
| Sampling, Logging, Analysis and Overhead | 19,700 | 80 | 1,580,000 |
| **Totals** | **19,700** | **$150** | **$2,950,000** |

Source: SRK, 2015

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# 28 Glossary

The mineral resources and mineral reserves have been classified according to the "CIM Definition Standards for Mineral Resources and Mineral Reserves" (May 10, 2014). Accordingly, the Resources have been classified as Measured, Indicated or Inferred, the Reserves have been classified as Proven, and Probable based on the Measured and Indicated Resources as defined below.

## 28.1 Mineral Resources

A **Mineral Resource** is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.

An **Inferred Mineral Resource** is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

An **Indicated Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.

A **Measured Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve.

## 28.2 Mineral Reserves

A **Mineral Reserve** is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The reference point at which Mineral Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported. The public disclosure of a Mineral Reserve must be demonstrated by a Pre-Feasibility Study or Feasibility Study.

A **Probable Mineral Reserve** is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Mineral Reserve is lower than that applying to a Proven Mineral Reserve.

A **Proven Mineral Reserve** is the economically mineable part of a Measured Mineral Resource. A Proven Mineral Reserve implies a high degree of confidence in the Modifying Factors.

## 28.3 Definition of Terms

The following general mining terms may be used in this report.

**Table 28.3.1: Definition of Terms**

| Term | Definition |
|---|---|
| Assay | The chemical analysis of mineral samples to determine the metal content. |
| Capital Expenditure | All other expenditures not classified as operating costs. |
| Composite | Combining more than one sample result to give an average result over a larger distance. |
| Concentrate | A metal-rich product resulting from a mineral enrichment process such as gravity concentration or flotation, in which most of the desired mineral has been separated from the waste material in the ore. |
| Crushing | Initial process of reducing ore particle size to render it more amenable for further processing. |
| Cut-off Grade (CoG) | The grade of mineralized rock, which determines as to whether or not it is economic to recover its gold content by further concentration. |
| Dilution | Waste, which is unavoidably mined with ore. |
| Dip | Angle of inclination of a geological feature/rock from the horizontal. |
| Fault | The surface of a fracture along which movement has occurred. |
| Footwall | The underlying side of an orebody or stope. |
| Gangue | Non-valuable components of the ore. |
| Grade | The measure of concentration of gold within mineralized rock. |
| Hangingwall | The overlying side of an orebody or slope. |
| Haulage | A horizontal underground excavation which is used to transport mined ore. |
| Hydrocyclone | A process whereby material is graded according to size by exploiting centrifugal forces of particulate materials. |
| Igneous | Primary crystalline rock formed by the solidification of magma. |
| Kriging | An interpolation method of assigning values from samples to blocks that minimizes the estimation error. |
| Level | Horizontal tunnel the primary purpose is the transportation of personnel and materials. |
| Lithological | Geological description pertaining to different rock types. |
| LoM Plans | Life-of-Mine plans. |
| LRP | Long Range Plan. |
| Material Properties | Mine properties. |
| Milling | A general term used to describe the process in which the ore is crushed and ground and subjected to physical or chemical treatment to extract the valuable metals to a concentrate or finished product. |
| Mineral/Mining Lease | A lease area for which mineral rights are held. |
| Mining Assets | The Material Properties and Significant Exploration Properties. |
| Ongoing Capital | Capital estimates of a routine nature, which is necessary for sustaining operations. |
| Ore Reserve | See Mineral Reserve. |
| Pillar | Rock left behind to help support the excavations in an underground mine. |

| **Term** | **Definition** |
|---|---|
| RoM | Run-of-Mine. |
| Sedimentary | Pertaining to rocks formed by the accumulation of sediments, formed by the erosion of other rocks. |
| Shaft | An opening cut downwards from the surface for transporting personnel, equipment, supplies, ore and waste. |
| Sill | A thin, tabular, horizontal to sub-horizontal body of igneous rock formed by the injection of magma into planar zones of weakness. |
| Smelting | A high temperature pyrometallurgical operation conducted in a furnace, in which the valuable metal is collected to a molten matte or doré phase and separated from the gangue components that accumulate in a less dense molten slag phase. |
| Stope | Underground void created by mining. |
| Stratigraphy | The study of stratified rocks in terms of time and space. |
| Strike | Direction of line formed by the intersection of strata surfaces with the horizontal plane, always perpendicular to the dip direction. |
| Sulfide | A sulfur bearing mineral. |
| Tailings | Finely ground waste rock from which valuable minerals or metals have been extracted. |
| Thickening | The process of concentrating solid particles in suspension. |
| Total Expenditure | All expenditures including those of an operating and capital nature. |
| Variogram | A statistical representation of the characteristics (usually grade). |

## 28.4 Abbreviations

The following abbreviations may be used in this report.

**Table 28.4.1: Abbreviations**

| Abbreviation | Unit or Term |
|---|---|
| AAS | atomic absorption spectroscopy |
| AEX | Exploitation Authorizations |
| Ag | silver |
| ARM | Mining Research Authorizations |
| Au | gold |
| AuEq | gold equivalent grade |
| BMG | Bureau Minier Guyanais |
| BRGM | Bureau de Recherches Géologiques et Minières |
| °C | degrees Centigrade |
| CIM | Canadian Institute of Mining, Metallurgy and Petroleum |
| cm | centimeter |
| $cm^2$ | square centimeter |
| $cm^3$ | cubic centimeter |
| cfm | cubic feet per minute |
| ° | degree (degrees) |
| dia. | diameter |
| EIS | Environmental Impact Statement |
| EMP | Environmental Management Plan |
| FA | fire assay |
| g | gram |
| g/t | grams per tonne |
| ha | hectares |
| $ID^2$ | inverse-distance squared |
| kg | kilograms |
| km | kilometer |
| $km^2$ | square kilometer |
| koz | thousand troy ounce |
| kt | thousand tonnes |
| kt/d | thousand tonnes per day |
| kt/y | thousand tonnes per year |
| LoM | Life-of-Mine |
| m | meter |
| $m^2$ | square meter |
| $m^3$ | cubic meter |
| masl | meters above sea level |
| mg/L | milligrams/liter |
| mm | millimeter |
| $mm^2$ | square millimeter |
| $mm^3$ | cubic millimeter |
| Moz | million troy ounces |
| Mt | million tonnes |
| m.y. | million years |
| NI 43-101 | Canadian National Instrument 43-101 |
| oz | troy ounce |
| ONF | Office National des Forêts |
| % | percent |
| PER | Exclusive Research Permits |
| PEX | Exploitation Permits |
| ppb | parts per billion |
| ppm | parts per million |
| QA/QC | Quality Assurance/Quality Control |
| QP | Qualified Person(s) |
| RC | rotary circulation drilling |

| **Abbreviation** | **Unit or Term** |
|---|---|
| RoM | Run-of-Mine |
| RQD | Rock Quality Description |
| SDOM | *Schéma Départemental D'Orientation Minière de la Guyane* |
| SEC | U.S. Securities & Exchange Commission |
| sec | second |
| SG | specific gravity |
| SMS | semi-massive sulfides |
| t | tonne (metric ton) (2,204.6 pounds) |
| t/h | tonnes per hour |
| t/d | tonnes per day |
| t/y | tonnes per year |
| TSF | tailings storage facility |
| µm | micron or microns |
| XRD | x-ray diffraction |
| y | year |

# Appendices

# Appendix A: Certificates of Qualified Persons

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## CERTIFICATE OF QUALIFIED PERSON

I, Eric J. Olin, MSc Metallurgy, MBA, SME-RM, MAusIMM do hereby certify that:

1. I am a Principal Consultant (Metallurgy) of SRK Consulting (U.S.), Inc., 7175 W. Jefferson Ave, Suite 3000, Denver, CO, USA, 80235.
2. This certificate applies to the technical report titled "NI 43-101 Technical Report on Updated Resources, Montagne d'Or Gold Deposit, Paul Isnard Project, Commune of Saint-Laurent-du-Maroni, NW French Guiana" with an Effective Date of April 11, 2015 (the "Technical Report").
3. I graduated with a Master of Science degree in Metallurgical Engineering from the Colorado School of Mines in 1976. I am a Registered Member of The Society for Mining, Metallurgy and Exploration, Inc. I have worked as a Metallurgist for a total of 31 years since my graduation from the Colorado School of Mines. My relevant experience includes extensive consulting, plant operations, process development, project management and research & development experience with base metals, precious metals, ferrous metals and industrial minerals. I have served as the plant superintendent for several gold and base metal mining operations. Additionally, I have been involved with numerous third-party due diligence audits, and preparation of project conceptual, pre-feasibility and full-feasibility studies.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I did not visit the Montagne d'Or property.
6. I am responsible for the preparation of mineral processing, metallurgy and recovery Sections 13 and 17, and portions of Sections 1 and 25 summarized therefrom, of this Technical Report.
7. I am independent of the issuer applying all of the tests in section 1.5 of NI 43-101.
8. I have not had prior involvement with the property that is the subject of the Technical Report.
9. I have read NI 43-101 and Form 43-101F1 and the sections of the Technical Report I am responsible for have been prepared in compliance with that instrument and form.
10. As of the aforementioned Effective Date, to the best of my knowledge, information and belief, the sections of the Technical Report I am responsible for contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 3rd Day of June, 2015.

*"Signed and Sealed"*

Eric J. Olin, MSc Metallurgy, MBA, SME-RM, MAusIMM

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## CERTIFICATE OF QUALIFIED PERSON

I, Bart A. Stryhas PhD, CPG # 11034, do hereby certify that:

1. I am a Principal Resource Geologist of SRK Consulting (U.S.), Inc., 7175 W. Jefferson Ave, Suite 3000, Denver, CO, USA, 80235.
2. This certificate applies to the technical report titled "NI 43-101 Technical Report on Updated Resources, Montagne d' Or Gold Deposit, Paul Isnard Project, Commune of Saint-Laurent-du-Maroni, NW French Guiana" with an Effective Date of April 11, 2015 (the "Technical Report").
3. I graduated with a Doctorate degree in Structural Geology from Washington State University in 1988. In addition, I have obtained a Master of Science degree in Structural Geology from the University of Idaho in 1985 and a Bachelor of Arts degree in Geology from the University of Vermont in 1983. I am a current member of the American Institute of Professional Geologists. I have worked as a Geologist for a total of 28 years since my graduation from university. My relevant experience includes minerals exploration, mine geology, project development and resource estimation. I have conducted resource estimations since 1988 and have been involved in technical reports since 2004.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
5. I visited the Montagne d'Or property on April 1 to 3, 2014.
6. I am responsible for the preparation of background, geology and resource estimation described in Sections 2 to 12, 14 to 16, 18 to 24, and 26 to 28, and portions of Sections 1 and 25 summarized therefrom, of this Technical Report.
7. I am independent of the issuer applying all of the tests in section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report. I completed a resource estimation on this project in 2008 for Golden Star Resources Ltd..
9. I have read NI 43-101 and Form 43-101F1 and the sections of the Technical Report I am responsible for have been prepared in compliance with that instrument and form.
10. As of the aforementioned Effective Date, to the best of my knowledge, information and belief, the sections of the Technical Report I am responsible for contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 3rd Day of June, 2015.

*"Signed and Sealed"*

______________________________

Bart A. Stryhas PhD, CPG